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IMŠENECKI [IMSHENETZKI] (A. A.) & NAZAROVA (Mme E. S.). О действии ультракоротких волн на грибы, разрушающие древесину **(Merulius lacrymans Schum.** и **Poria vaporaria Pers.).** [The action of ultra-short waves on wood-destroying fungi (*Merulius lacrymans* Schum. and *Poria vaporaria* Pers.).]—*Bull. Acad. Sci. U.R.S.S.*, (*Sér. biol.*), *1937*, 1, pp. 221–230, 1 fig., 1937. [English summary.]

It was experimentally shown by the authors that exposure for 40 to 60 mins. to irradiation by ultra-short waves (length 4·5 m., generated by a 500 volts WK lamp, on a 30 to 45 milliamp. anode, of calibre 504×10^8 ergs) completely killed pure cultures of *Merulius lacrymans* and *Poria vaporaria* [*R.A.M.*, xvi, p. 429] on sawdust, enclosed in paper wrappers, the lethal action being independent of the mass of the samples of infected sawdust exposed (3 gm. and 112 gm.). The killing effect of the waves was even more rapid when the cultures were enclosed inside 5 cm.-thick wood blocks, but glass appeared to arrest the waves in direct relation to its thickness. Two- to three-month-old cultures were more resistant than those below 15 days or over $3\frac{1}{2}$ months in age. Sub-lethal doses of the waves inhibited the germination of *M. lacrymans* and *P. vaporaria* spores on fresh media, and considerably slowed down the growth of their mycelia, besides causing morphological changes in the hyphae, which persisted for a long time in subcultures from the irradiated cultures. These results lead the authors to believe that the sterilization of structural and other timber by ultra-short waves is a practical possibility, provided these waves are experimentally shown not to have a detrimental effect on the physical properties of wood.

WAGER (V. A.). **Black-rot disease of Cabbages.**—*Fmg S. Afr.*, xii, 133, pp. 170–171, 4 figs., 1937.

A popular account is given of black rot of cabbages (*Bacterium campestre*) [*Pseudomonas campestris*: *R.A.M.*, xv, p. 335] which is often epidemic in South Africa, wiping out large plantings. The disease is commonly spread by infected seed and since most of the seed sown in South Africa is imported, usually without any guarantee that it comes from a healthy stock, the author recommends that all seed should be sterilized by steeping in mercuric chloride (1 in 1,000) for 20 to 30 minutes. Seed-beds should be situated on high ground to avoid

drainage from infected land, and if not in virgin soil the bed should be sterilized by making a fire on it prior to sowing.

DEARBORN (C. H.), THOMPSON (H. C.), & RALEIGH (G. J.). **Cauliflower browning resulting from a deficiency of boron.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 483–487, 1937.

In further investigations into the browning of cauliflowers prevalent in New York State [*R.A.M.*, xv, p. 769], a greenhouse test was carried out in which 60 Super Snowball cauliflower plants were grown in pots in Lackawanna silt loam, to which was applied a 4–8–7 fertilizer at the rate of 1 ton per acre, and borax at rates ranging from 2·5 to 25 lb. per acre, one series of pots receiving no borax. At maturity all the controls (without borax) showed severe browning and had the characteristic bitterness; 4 out of 10 of the plants given borax at the rate of 2·5 lb. per acre showed light internal but no external discoloration, while only 2 out of 10 of those given borax at 5 lb. per acre showed minute, brown spots inside the apical part of the stem. No discoloration developed in any of the plants to which borax was applied at 7·5, 15, or 25 lb. per acre.

In a subsequent field experiment plots on two types of soil (Lackawanna and Culvers silt loam) were given four treatments, viz., no borax, and borax at the rate of 5, 10, and 25 lb. per acre, each in addition to 4–8–7 fertilizer. At maturity the treatments on the first type of soil gave, respectively, 24·4, 1·3, 0·5, and 0 per cent. browning, the corresponding figures on the second soil being 49·3, 0, 0, and 0 per cent.

Tests and observations on a number of farms showed that in all cases where borax was applied at the rate of 6 lb. or more per acre (even after the heads had begun to form) the condition was controlled, except where the borax was mixed with hydrated lime.

SNYDER (G. B.) & DONALDSON (R. W.). **The use of borax in controlling dark center of Turnips.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 480–482, 1937.

After briefly describing the symptoms of 'dark centre' or brown heart of swedes [*R.A.M.*, xvi, p. 649], and pointing out that the true turnip does not show the water-soaked areas in the parenchyma tissue characteristic of the condition in swedes, but becomes pithy or punky, the authors state that 5 years' observations in different parts of Massachusetts showed that the disease occurred on all types of soil. Where seaweed was used in large quantities in pit storage in the field, the roots of plants growing immediately over the pits the following year were relatively clean. Clean roots frequently occurred on raw subsoil brought to the surface during the previous year's pitting. Plants grown on soil where manure had been heaped produced perfectly clean roots. Field trials indicated that the condition can be controlled by borax applications of 10 to 20 lb. per acre as powder or spray if applied to the drill; when broadcast 20 to 30 lb. per acre should be used.

OSBORN (H. T.). **Studies on the transmission of Pea virus 2 by aphids.**—*Phytopathology*, xxvii, 5, pp. 589–603, 4 figs., 1937.

Pea virus 2 [*R.A.M.*, xvi, p. 583 and cf. ibid., xvi, p. 650] was trans-

mitted by mechanical inoculation from broad beans (*Vicia faba*) to Telephone and Alderman peas, field peas, sweet peas, crimson and red clovers (*Trifolium incarnatum* and *T. pratense*), white sweet clover (*Melilotus alba*), and Green Stringless Refugee, Corbett Refugee, and Robust garden beans (*Phaseolus vulgaris*), and retransferred from each of these hosts to *V. faba*. It was further conveyed from *V. faba* to peas (garden and field) and Green Stringless Refugee beans by means of the pea aphid (*Macrosiphum pisi*), which also acted as a carrier of infection from red clover to broad beans. Wisconsin Resistant Perfection peas and Great Northern Idaho No. 1 beans reacted negatively to inoculation with pea virus 2. The virus was inactivated by 10 minutes' exposure to a temperature of 64° C. and by 5 days' ageing *in vitro*. It was transmitted in 5 minutes by both nymphs and adults, and by single insects of *M. pisi*, *M. gei* [*M. solanifolii*], and *Aphis rumicis* from diseased to healthy *V. faba* plants following a 5-minute feeding period. Some colonies lost the virus when held for 15 minutes on healthy plants, and all three species of insect did so when allowed to feed continuously for one hour on healthy plants. When held without access to food, *A. rumicis* retained pea virus 2 for 5 hours, *M. pisi* for 8, and *M. solanifolii* in one case for 24. No incubation period of the virus was observed in colonies of these insects fed for one day on diseased plants and transferred to a succession of healthy ones for a total period of 14 days.

Wilson (A. R.). **The chocolate spot disease of Beans (Vicia faba L.) caused by Botrytis cinerea Pers.**—*Ann. appl. Biol.*, xxiv, 2, pp. 258–288, 2 pl., 3 figs., 1937.

Experimental data having excluded bacterial and virus agents as the cause of chocolate spot of beans (*Vicia faba*) [*R.A.M.*, xiv, p. 734; xvi, p. 651] in Britain, a series of inoculations were carried out with a strain of *Botrytis cinerea* (B.S. 501) isolated at Cambridge in 1932. Upwards of 500 bean plants were successfully infected under greenhouse conditions, the inoculated plants being placed in water under bell jars for the first 48 hours, and the fungus being re-isolated from artificially affected plants. Field experiments confirmed this result.

Two types of infection by *B. cinerea* were observed, 'aggressive' causing blaekening and death of the shoot system, and 'non-aggressive' causing discrete, chocolate-coloured lesions; the former is responsible for most of the loss caused by epidemic outbreaks of the disease. On plants kept under suitable conditions for infection there was a progressive increase in the total number of visible lesions over a period of at least 5 days from the application of the spore suspension, a dilute suspension leading to non-aggressive infection and a dense suspension to aggressive infection. If the plants treated with the heavy suspension were removed after 24 hours to a humidity unsuitable for infection the attack remained non-aggressive. Mycelium was abundant in lesions of the aggressive type but occurred only sparsely in non-aggressive infections.

The maximum temperature for infection is about 30° C., the optimum about 20°, and the minimum between +1° and −1°. Evidence is adduced that a film of water is essential for infection, and any factors

increasing evaporation tend to inhibit or decrease infection. Data are presented showing that the optimum conditions for aggressive infection are (*a*) the presence of large numbers of spores on the foliage, (*b*) rain to provide a water film, (*c*) a high humidity and rain to maintain the film for some days, (*d*) little or no wind or sun to increase evaporation, and (*e*) an air temperature between 15° and 20°. The relationship between rainfall and the severity of chocolate spot was statistically established, epidemics being correlated with abnormally heavy rainfall during the critical months of April, May, June, and July. Experiments showed that spores of *B. cinerea* are capable of retaining their viability over long periods (more than a month) of adverse conditions. Any factor tending to weaken the crop, such as acid soil, deficiency of potash [ibid., xv, p. 698] or phosphate, and waterlogging of the soil, renders it more liable to aggressive infection, while shelter from the prevailing wind and a dense stand also favour the disease.

No satisfactory method of control has yet been found, but the likelihood of an epidemic is lessened if the predisposing soil factors are corrected. Spring-sown beans have manifested reduced liability to attack but are more readily infested by *Aphis rumicis*.

The pathogenicity of *B. cinerea* to a number of leguminous plants was established, but the only species showing such severe symptoms as *V. faba* was *V. sativa*. Sainfoin (*Onobrychis sativa*) showed slight chocolate spotting.

A comparison of *B. cinerea* with other species of *Botrytis* capable of causing chocolate spot, including *B. fabae* Sard. [ibid., ix, p. 424], *B. fabae* Ikata [ibid., xiii, p. 741] (neither of which superficially resembles *B. cinerea* strain B.S. 501), and Brierley's albino strain of *B. cinerea*, showed that all forms of *B. cinerea* and other species of *Botrytis* are capable of causing chocolate spot lesions. The disease in Britain is probably caused by many forms belonging to the group species *B. cinerea*.

[A popular account of this investigation is published in *J. Minist. Agric.*, xliii, 11, pp. 1047–1049, 1 pl., 1937.]

BREMER (H.). **Über die bisher fälschlich 'Zwiebelrotz' genannte Gelbstreifigkeit an Zwiebelsamenträgern.** [On the yellow streakiness of Onion seed-bearers hitherto wrongly designated 'Onion slime'.]—*Phytopath. Z.*, x, 1, pp. 79–105, 5 figs., 1937.

The onion trouble hitherto designated as 'slime disease' ('Rotzkrankheit') [*R.A.M.*, xiv, p. 553] would be more appropriately described as 'yellow streakiness', and the adoption of the latter name is therefore proposed. The disorder appears from comparative studies to be identical with the American 'yellow dwarf' [ibid., xv, p. 486], but actual evidence of the transmissibility of the German disease by insects is still incomplete.

The symptoms of the disease in seed-bearers include undulation, contortion, drooping, and a yellowish-green, mostly definitely striate discoloration of the leaf blades, the last-named feature also affecting the inflorescence axes (seed-bearers), the development of which is strongly impeded. Flower-setting and seed production are severely impaired, yield reductions of 51, 44, and 69 per cent. having been reported in 1929, 1932, and 1933, respectively, at the Aschersleben branch of the

Biological Institute. Although yellow streakiness is primarily a disease of the seed-bearers, non-flowering first-year plants may also be affected, commencing in the height of summer or in the autumn with a thickening of the collar which obliterates the normal sharp line of demarcation between the bulb and the foliage. Such bulbs do not mature properly and are very liable to storage rots; they tend to sprout abnormally early. The disturbance in the metabolic processes of yellow-streaked plants is reflected in the insipidity of the onions. The incidence of infection is particularly high in certain districts where intensive onion cultivation is practised, and is increased by late planting and wide spacing. Yellow streakiness has been observed in the field on leeks. The disease is not transmissible by the seed. The results of insect transmission experiments, though not, as stated above, affording irrefutable evidence of this means of conveyance, certainly point to the implication of thrips and aphids, 99 and 100 per cent., respectively, of the plants infected through which in one test contracted yellow streak symptoms compared with 23 per cent. in the controls.

The few cases of spontaneous recovery from yellow streakiness are without economic importance, and steps should be taken to combat the disease by the isolation of one- and two-year-old seed-bearer fields, the use for seed only of small, firm, late sprouting onions, and the rigorous elimination of infected plants from the field and of diseased bulbs from storage.

CAYLEY (DOROTHY M.). **Experimental spawn and Mushroom cultures. I.** —*Ann. appl. Biol.*, xxiv, 2, pp. 311–322, 3 pl., 1937.

In comparative cultural studies on wild and cultivated mushrooms [*R.A.M.*, xvi, p. 365] the author found that the wild field mushroom (*Psalliota campestris*) and the horse mushrooms (*P. arvensis*) failed to grow on stable manure compost, fermented for 14 days or more, but grew quite freely on unfermented composts (comprising chopped straw, hay, and sand in varying proportions plus nutrient solution). The wild haystack mushroom (*P.* sp. intermediate between the foregoing, and with four-spored basidia) also refused to grow on stable manure compost, but tolerated the by-products of 14 days' fermentation at a high temperature. The cultivated varieties (comprising the fuscous, white, white fragrant, and honeymoon white varieties) grew on unfermented composts, on high temperature composts fermented up to 35 days, and on prolonged low temperature composts, showing varietal differences on the last-named. The results showed a definite sequence in physiological behaviour from the low facultative saprophytism of the two wild grassland species to the high saprophytism of the cultivated forms, the wild haystack mushroom being intermediate. As a result of numerous tests the following compost has been adopted for growing spawn of all the forms: 2 gm. each of dry chopped straw and dry chopped hay are mixed and moistened with 10 c.c. rain water, 2 gm. crushed oats and ½ oz. coarse sand (washed and dried) are then mixed in, the compost placed in a tube 8 by 1½ in., lightly pressed down, a layer of dry sand placed on the surface, the whole moistened with 10 c.c. Styer's nutrient solution A (*Amer. J. Bot.*, xv, pp. 246–250, 1928) [$MgSO_4$ 0·02M, K_2SO_4 0·01M, KH_2PO_4 0·04M, $CaCl_2$ 0·002M, $FeSO_4$ trace, NH_4NO_3 0·1M,

NaOH to bring P_H to 6·0] and sterilized on three successive days [*R.A.M.*, xiii, p. 491].

Gomez-Menor (O.). **Notas fitopatológicas.** [Phytopathological notes.] —*Rev. Agric., S. Domingo*, xxviii, 91, pp. 170–172, 3 figs., 1937.

In addition to the well-known cassava diseases caused by *Gloeosporium manihotis* [*R.A.M.*, xii, p. 680] and *Cercospora henningsii* [ibid., xv, p. 280], a case of rust (*Uromyces jatrophae*) has been observed on the crop in one locality of the Dominican Republic. Bordeaux mixture is recommended for the control of the last-named disease.

Williams (P. H.), Orchard (O. B.), White (H. L.), Oyler (E.), Ainsworth (G. C.), & Read (W. H.). **Plant diseases.**—*Rep. exp. Res. Sta., Cheshunt, 1936*, pp. 40–69, 1937.

In investigations on rose rust [*Phragmidium* sp. *R.A.M.*, xv, p. 653] by P. H. Williams (pp. 41–43) the results of cross inoculations with strains of the rust from briars (*Rosa canina*) confirmed those previously obtained. Overwintered teleutospores from the rose germinated successfully on 2nd June, when floated on distilled water. Inoculations with teleutospores were not successful, but leaves bearing the aecidial stage have been observed. Both the caeoma and uredospore stages are described.

O. B. Orchard (p. 43) reports that rose mildew (*Sphaerotheca pannosa*) was successfully controlled in a commercial nursery by bouisol-white-oil emulsion (now placed on the market) applied at the end of June and thereafter at intervals of three weeks. Slight spotting was caused by the mixture on fully open blooms.

P. H. Williams (pp. 45–46) gives an account of his investigation of the newly recorded invader of mushroom [*Psalliota* spp.] beds, *Pseudobalsamia microspora* [ibid., xvi, p. 86]. On pp. 46–48 he describes his studies on *Oospora fimicola* [ibid., xvi, p. 653] which caused severe injury in mushroom houses. The fungus was distinctly favoured by an alkaline medium, the growth per day at P_H 2·8 to 4·6, 5·0, 6·2, 7·2, and 7·6 being nil, 0·07, 0·258, 0·291, and 0·301 mm., respectively. Evidence was obtained that manure must be decomposed to a certain extent by composting before it is suitable for the growth of *O. fimicola*.

H. L. White (pp. 48–52) gives notes on control measures against the *Verticillium* wilt (*V. cinerescens*) of the perpetual flowering carnations, some of which have already been noted from another source [ibid., xvi, p. 183]. A mechanical barrier composed of bricks or drain pipes to prevent spread is not favoured, though a raised bench should secure a clean crop at first. A layer of lime laid carefully so as to remain unbroken, combined with sterilization or replacement of the top soil appears to promise successful results. The same author (pp. 52–54) discusses anther smut of carnations (*Ustilago violacea*) and states that measures recommended in his previous paper [ibid., xvi, p. 180] have resulted in the elimination of the disease from one nursery. After cutting blooms for market from an infected bed, infected buds should be systematically removed.

In further studies on crown rot of rhubarb in 1936, the author isolated *Bacterium rhaponticum* once from diseased material, 42 out of 57 isolations remaining sterile and 11 yielding bacterial colonies. An

irregular brownish network of vascular bundles, devoid of any associated organism was present in diseased plants, as well as extensive coffee-coloured areas characteristic of crown rot. It is suspected that bacteria are not solely responsible for the disease.

A serious attack of halo blight of glasshouse-grown runner beans [*Bacterium medicaginis* var. *phaseolicola*: ibid., xvi, p. 150] occurred during 1936, the relatively humid conditions favouring the disease. Germination of seed marked with lesions in 1935 was 80 per cent. compared with 88 per cent. for unmarked seed, the corresponding figures for 1936 being 88 and 98 per cent., respectively. Of the 1935 seedlings 4·2 per cent. were diseased compared with 9·7 per cent. for the 1936 seed. Plants placed under bell jars showed 44 per cent. affected by a marginal rot on the first leaves, and in 66 per cent. of these plants only the diagonally opposite margins of each of the first pair of leaves were affected, suggesting that infection occurred through the marginal water pores as the leaves pushed through the soil. Control of the disease is largely dependent on the provision of clean seed.

Glasshouse runner beans suffer appreciable losses from root and foot rots associated with *Fusarium martii* var. *phaseoli* [*F. solani* var. *martii* f. 3: ibid., xiv, p. 730], *Thielavia basicola*, *Botrytis* sp., or *Phytophthora* sp. Infection by *Botrytis* has been observed from decaying cotyledons which come to rest against the stem. Growers are recommended to remove the cotyledons before they touch the stem.

In tests of calcium hypochlorite as a disinfectant of tomato seed, over 98 per cent. of the treated seeds were completely sterile.

E. Oyler (pp. 58–59) records a species of *Phytophthora* resembling *P. parasitica* as the cause of a wilt of *Solanum capsicastrum* [ibid., xiv, p. 636] and verbena. The stems were brown at the nodes and the leaves arising from them were brown from the petioles upwards, the roots being healthy. Both tomato and *S. capsicastrum* were successfully inoculated through wounds, and it is thought that the outbreak was due to infection of injuries received in severe thunderstorms.

P. cryptogea caused a 'black neck' disease of marguerite [*Chrysanthemum frutescens*] in which the leaves of the whole or part of the plant wilted and the lower parts of the stems blackened, the roots showed a slight browning. The pathogenicity of the fungus was established in inoculation experiments.

G. C. Ainsworth (pp. 59—62) reports that during the year bushy stunt [ibid., xv, p. 757] of tomatoes was only recorded once and caused no appreciable damage; tomato enation mosaic reappeared in Lanarkshire and was also found in Sussex. Lettuce mosaic occurred at the Station and in a commercial nursery, where it affected both cos and cabbage varieties; the results of preliminary experiments indicated that only one virus was involved. By means of the sodium sulphite method [ibid., xv, p. 655] tomato spotted wilt was detected in several samples of chrysanthemums received during the year. Considerable differences were observed in the symptoms produced by the virus on different varieties of chrysanthemum: the Edwin Seidwitz variety developed ring and line patterns in the spring and indefinite, irregular mottling later, Romance showed symptoms resembling those of eelworm infection, and Friendly Rival yellowing of the veins in the upper leaves and

slight browning of the interveinal areas. Infected plants should not be used for propagating. Cucumber virus 1 was recorded on *Primula japonica* causing a serious mosaic. Mosaic or yellow stripe occurred on daffodils [*Narcissus pseudo-narcissus*] under glass, Golden Spur being very susceptible, and mosaic affected about 90 per cent. of Wedgwood bulbous iris plants raised from bulbs imported from Holland.

W. H. Read (pp. 64–69) describes a peculiar, sharply defined, circular spotting of tomato fruits, mostly on the upper halves, which he terms 'water spot' [cf. ibid., xvi, p. 421]. In size the spots vary from 0·5 to 3 mm. when first observed and rarely exceed 1 cm. diameter on the ripe fruit. It was found that the spots are only formed when spores are suspended on the fruit in minute drops. When *Botrytis cinerea* spores are added to larger drops a slightly raised or blister-like spot is formed lighter in colour than the remainder of the surface. Spraying with a suspension of spores of *Cladosporium fulvum* taken from tomato leaves induced the formation of spots within 9 days. The actual process of spot formation is obscure, but possibly the spots are due to the liberation of some toxic substance by the germinating *Botrytis* spores. Control lies in reducing the condensation of moisture and avoiding conditions favouring the growth of *Botrytis* and *Cladosporium*.

MARCHAL (E.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État, pendant l'année 1936.** [Observations and researches carried out at the State Phytopathological Station during the year 1936.]—*Bull. Inst. agron. Gembloux*, vi, 2, pp. 73–80, 1937. [Flemish, German, and English summaries.]

This report [cf. *R.A.M.*, xv, p. 775] contains among others the following items of phytopathological interest. Potatoes in Belgium were widely attacked by *Alternaria solani* [ibid., xv, p. 494] and were also affected by pseudo-net necrosis [ibid., xvi, p. 55], which was particularly prevalent on the Erdgold, Roode Star, and Furore varieties. The latter disease appears to be seed-borne, but in a rather irregular fashion, the symptoms varying greatly in intensity. Dwarf kidney beans [*Phaseolus vulgaris*] grown from seed imported from France were attacked in July 1936 by *Bacterium medicaginis* var. *phaseolicola* [see preceding abstract] not recorded hitherto in Belgium. The disease spread rapidly, but during August it became arrested, apparently as a result of drought. Tomato spotted wilt was more prevalent than formerly. Much damage was caused to ornamentals in glasshouses by *Hypochnus* [*Corticium*] *solani*, especially to species of *Asparagus*, *Araucaria*, *Azalea*, and *Begonia*. In establishments where one particular species of ornamental plant is grown on a large scale the disease may become endemic; in such a case new soil should be used and all appliances disinfected. *Marssonina daphnes* [ibid., xiv, p. 585] was found on *Daphne mezereum*. Cherry trees in several localities were attacked by *V*[*enturia*] *cerasi*, which is becoming increasingly prevalent in Belgium.

STELL (F.). **Report of Mycologist, 1936.**—*Rep. Dep. Agric. Trin. Tob.*, *1936*, pp. 52–56, 1937.

In this report [cf. *R.A.M.*, xv, p. 705] it is stated that during 1936 cacao witches' broom (*Marasmius perniciosus*) became more prevalent

than formerly in all affected areas in Trinidad though substantial acreages are still free from the disease. For example, the number of brooms counted on 24 estates in districts of heavy and medium infection in 1934, 1935, and 1936 was, respectively, 19,297, 38,021, and 62,192. On the Government cacao estate at Marper, where all diseased tissues are collected and destroyed every other month, 448,500 diseased tissues were collected in 1936, as against only 166,495 in 1935. The cost of control at Marper including supervision amounted to $5·4 per acre in 1936, as against $4 in 1935, but effective control under commercial conditions in areas of medium or severe infection would probably not cost more than $3 to $3·5 per acre. Observations on a block of 100 trees in a heavily infected area showed that the monthly production of sporophores for August to December, inclusive, amounted to 1,010, 4,805, 19,395, 6,373, and 9,084, the corresponding rainfall figures being 10·1, 12·77, 9·39, 17·37, and 15·04 inches. Very wet or very dry weather is unfavourable to sporophore production, which reaches a peak during showery weather, but in this case the high figure for October may be associated with a drop in temperature. Counts made on eleven selected properties during the whole cropping period showed that the average loss of mature pods due to the disease was 33 per cent. of the crop, the lowest and highest figures being 8 and 67 per cent., respectively. On the Marper estate the loss was about 6 per cent. Of 200,000 trees under observation for resistance only about 12 remain for further experimental testing.

Moko disease of bananas (*Bacterium solanacearum*) [ibid., xv, p. 75] was found to be practically absent from some areas and relatively widespread in others. *Cercospora musae* [ibid., xvi, p. 624] is known to affect the Giant Governor, Governor, Gros Michel, and Sucrier banana varieties; its incubation period may extend for over two months, and dissemination occurs through the agency of wind and rain. In one locality many Gros Michel stools showed a blue-black discoloration of the vasculars of the central tissues of the rhizomes, which experimental evidence indicated was a form of water-soak.

Mild scab (*Sphaceloma fawcettii*) [*Elsinoe fawcetti*] infection was noted on the foliage of over 1,000 four- to seven-year old Marsh grapefruit trees growing on 300 acres of old cacao land in the Santa Cruz Valley [ibid., xvi, p. 527]. The fungus was first noted by the writer on grapefruit in Trinidad in 1922 in the Diego Martin district on miscellaneous grapefruits, including Marsh, which is known to be moderately susceptible, and since then has been found on King and Curaçao oranges. The disease appears to have been present for only a few months in Santa Cruz Valley, and may have been favoured by heavy dews. All infected tissues should be collected and destroyed.

Papaw was seriously affected by mosaic [ibid., xv, p. 385], stem canker, and *Asperisporium* leaf disease [*A. caricae*: ibid., xv, p. 240].

MILBRATH (D. G.). **Bureau of Plant Pathology.**—ex *Rep. Calif. Dep. Agric., 1936* (*Bull. Dep. Agric. Calif.*, xxv, 4), pp. 575–582, 1937.

Peach mosaic [*R.A.M.*, xvi, p. 543] was recorded in the latter part of 1935 in the Riverside and San Bernardino counties of California, and has since been found in San Diego where only 19 trees were affected

and these were immediately destroyed. Under an eradication campaign [cf. ibid., xvi, p. 88] an intensive survey showed the disease to be present over 101 square miles, and so far 8,678 mosaic-infected trees have been removed together with 27,012 abandoned trees.

The results of maintaining celery-free periods in the vicinity of Venice with the object of controlling western celery mosaic [ibid., xv, p. 191] have been very gratifying. The yields have been increased and the quality improved.

A system of freeing wash water from sugar beet factories from sclerotia of *Sclerotium rolfsii* [ibid., xv, p. 518] was installed at a factory in Clarksburg, Yolo County, based upon principles of settling, flotation, and screening. With an intake of 800 galls. per minute no evidence of sclerotia passing out of the cleansing system was found in several tests.

Re-examination of two plantings of chestnut previously infected with blight [*Endothia parasitica*: ibid., xiv, p. 726] resulted in the discovery of 17 lightly infected trees and 1 severely infected, all apparently the result of initial infection several years previously. The diseased trees were uprooted and burnt.

Dead arm of grapes caused by *Cryptosporella viticola* [ibid., xvi, p. 299] was found in Sacramento and Los Angeles counties in 1935. Sanitation, spraying, and dusting have had some controlling effect on the disease.

Berthelot (A.) & Amoureux (Germaine). **Remarques sur l'utilisation des plantules aseptiques pour l'étude de la formation des tumeurs.** [Observations on the utilization of aseptic seedlings for the study of tumour formation.]—*C.R. Acad. Sci., Paris*, cciv, 18, pp. 1360–1362, 1937.

The authors describe their method of maintaining and inoculating seedlings with *Bacterium tumefaciens* [*R.A.M.*, xvi, p. 303] during autumn and winter, pointing out that it is necessary to avoid large lesions and wherever possible merely to apply the inoculum locally by means of solutions or suspensions, any tendency to evaporation being carefully watched. By keeping the sterile seedlings in culture tubes in a dark chamber at 25° to 27° C. for a few days before and after inoculation with *Bact. tumefaciens* the production of tumours is greatly expedited; in one such case a gall was found to measure 10 by 6 mm. after 14 days, 7 of which were spent in the dark.

Link (G. K. K.), Wilcox (Hazel W.), & Link (Adeline De S.). **Responses of Bean and Tomato to Phytomonas tumefaciens, P. tumefaciens extracts, β-indoleacetic acid, and wounding.**—*Bot. Gaz.*, cxviii, 4, pp. 816–867, 22 figs., 1937.

The differential responses of Red Kidney bean (*Phaseolus vulgaris*), Marglobe, Bonnie Best, and Ponderosa tomatoes, and *Bryophyllum* to inoculation with pure cultures of *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xvi, p. 660] are attributed to variations in the axial growth patterns of the host. Beans are strongly disposed following wounding to the formation of surface and internal callus and their derivatives, adventitious roots, root regeneration, and root fasciation. Growth substances are apparently formed or activated in all the aerial vegeta-

tive organs and transported to the main axis, where they move chiefly downwards, though upward and transverse motion also occurs. The introduction into beans and tomatoes of varying concentrations of heteroauxin paste under diverse conditions was found to induce practically the entire range of known phytopathological conditions, including tumour formation.

Bact. tumefaciens produces β-indoleacetic acid (heteroauxin) in dextrose-tryptophane or in dextrose-tryptophane peptone liquid or solid (agar medium). The crude ether extract of the organism induces in beans and tomatoes symptoms resembling those caused by inoculation with *Bact. tumefaciens* or heteroauxin treatment [ibid., xv, p. 782]. Practically identical histological and cytological effects follow the introduction of unequal amounts of 3 per cent. heteroauxin paste and crude extract of *Bact. tumefaciens* into the bean hypocotyl, viz., cell enlargement and division, with the resultant suppression of normal differentiation and maturation, which are replaced by the development of new meristems and fresh differentiations in abnormal sites. Schizogenous cavities are formed and ultimately filled with peripheral callus.

The paper concludes with a theoretical discussion of the etiological implications of these experimental data, in connexion with which a tentative nomenclature and classification of growth substances are proposed, and hypotheses are advanced in partial explanation of legume nodules, mycorrhiza, and other agricultural phenomena in terms of auxones.

Wehnelt (B.). **Mathieu Tillet—Tilletia. Die Geschichte einer Entdeckung.** [Mathieu Tillet—*Tilletia*. The history of a discovery.]—*Nachr. SchädlBekämpf., Leverkusen*, xii, 2, pp. 45–148, 15 figs. 1 diag., 1937. [English, French, and Spanish summaries on pp. 147–148.]

This is an interesting, fully documented historical study on the outstanding contributions of the French economist, Matthieu Tillet (1714 to 1791), to the knowledge of cereal diseases, especially wheat smuts, which are commemorated in the genus *Tilletia*.

Gorlatch (A. A.). Наследственность устойчивости к бурой ржавчине у гибридов мягких Пшениц. [Inheritance of resistance to brown rust in soft Wheat hybrids.]—*Науч. Зап. по Сахарн. Промышл.* [*Sci. Notes Sugar Indus. Agron. Part.*], Kieff, [Grey Ser.], xiii, 5–6, pp. 138–151, 1937.

A summarized account is given of genetical studies from 1930 onwards at the Belaya-Tzerkoff Experimental Breeding Station [Ukraine] on the inheritance of resistance to brown rust (*Puccinia triticina*) [*R.A.M.*, xvi, p. 522] in hybrids between two local soft wheat (*Triticum vulgare*) lines (037 and 074), each possessing one factor (R) for resistance and one factor (S) for partial resistance to the rust, and other wheat varieties of varying genetical constitution for resistance. In crosses between the local line 037 and Minhardi or Belaya-Tzerkoff 6182 lines, neither of which possesses either factor, susceptibility in F_1 was dominant, and in F_2 segregation occurred on the basis of two factor pairs, while in crosses between the same line and Ukrainka or Poltavka,

each only possessing the S factor, resistance was dominant in F_1, and segregation in F_2 occurred on the single factor basis. Crosses between 037 and Co-operatorka gave an intermediate type of inheritance in F_1. From a practical standpoint, it is stated that the work has led to the development of a number of lines very nearly equal in resistance to brown rust to the resistant parents 037 and 074, while combining most of the desirable commercial properties of the susceptible parent Ukrainka, and which during the heavy rust year 1935 gave an increase of 50 per cent. in their yield over the standard Ukrainka variety.

Humphrey (H. B.), Johnston (C. O.), & Caldwell (R. M.). **A revision of the numbers assigned to physiologic races of the leaf rust of Wheat, Puccinia triticina Eriks.**—*U.S. Dep. Agric., Bur. Pl. Ind., Div. Cereal Crops & Dis.*, 14 pp., 1936. [Mimeographed. Received September, 1937.]

Recent confusion in numbering physiologic races of leaf rust of wheat (*Puccinia triticina*) has led the authors to propose a revised and partly renumbered list of races, with an accompanying key and table of reactions. Scheibe's race 16 [*R.A.M.*, ix, p. 767] is retained, but the four races separated by Waterhouse [ibid., xi, p. 629] are designated 26 A, 26 B, 68 A, and 68 B, and it is recommended that when races are subdivided through the use of other differential varieties the subdivisions be distinguished by letters. Mehta's race 55e [ibid., xiii, p. 500] is renumbered 63, as 55 has already been used by Sibilia [ibid., xvi, p. 89]. The race 56 of Stakman *et al.* [ibid., xv, p. 242] is now race 64 for a similar reason. Races 57 and 58 of these workers are only sub-races of 68, described by Florence M. Roberts as a mutant of an English race [ibid., xv, p. 707]. The writers combine Sibilia's races LXVII P, LXVIII P, and LXXII P as race 84, and regard his LXXI P, LXXIII P, and LXXIV P as coming within races 58, 4, and 25, respectively. Sibilia's LXIX P and LXX P are unquestionably new races and are numbered 85 and 86, respectively.

Larose (E.) & Vanderwalle (R.). **Quelques résultats d'infection artificielle d'Ustilago nuda tritici Schaff. sur le Froment.** [Some results obtained in the artificial infection of Wheat by *Ustilago nuda tritici* Schaff.]—*Bull. Inst. agron. Gembloux*, vi, 2, pp. 81–87, 1937. [Flemish, German, and English summaries.]

In studies on the nature of the resistance shown by some wheat varieties in Belgium to loose smut (*Ustilago tritici*) [*R.A.M.*, xvi, p. 166] the authors artificially infected three susceptible varieties (Hybride 40, Hybride Vilmorin 27, and Prince Léopold) and three completely resistant ones (Hybride du Jubilé, Hybride Vilmorin 23, and Hybride du Joncquois) by brushing the spores of the fungus on to the stigmas while the glumes were open. The seed thus produced from the susceptible varieties yielded susceptible plants and that from the resistant varieties gave plants that remained unaffected, indicating that resistance results from internal biological factors, and not from the morphological character of the ear.

The following reciprocal crosses were then made between susceptible and resistant wheats, viz., Pansar III (resistant) × Hybride 40, Hybride

40×Pansar III, Pansar III×Hybride 27, Hybride 27×Pansar III, Pansar III×Prince Léopold, and Prince Léopold×Pansar III, and artificial floral infections made at pollination. No smutted ears occurred in the F_1 generation, showing that resistance was entirely dominant in whatever direction the crossing was made.

When ears from F_1 plants of various crosses between resistant and susceptible wheats were artificially infected with loose smut during flowering, the F_2 plants subsequently showed a very marked dominance of resistant forms. Under conditions of natural infection the progeny of crosses between susceptible and resistant wheats showed far fewer susceptible than resistant lines.

Luthra (J. C.), Sattar (A.), & Ghani (M. A.). **A comparative study of species of Septoria occurring on Wheat.**—*Indian J. agric. Sci.*, vii, 2, pp. 271–289, 3 pl. (1 col.), 3 graphs, 1937.

Comparative studies are described on a species of *Septoria* causing a serious disease of wheat in the Punjab, the strain studied having been isolated from spots on wheat leaves at Lyallpur in 1933, a culture of *S. tritici* [*R.A.M.*, xvi, p. 299] received from the Centraalbureau voor Schimmelcultures, Baarn, and an isolation of *S. nodorum* [ibid., xiv, pp. 348, 678] obtained from Kenya in 1933. Pycnidia of the first-named fungus were noted on wheat stems and awns for the first time in 1935, but no definite spots were formed on these parts. *S. tritici* from Baarn produced similar symptoms to the foregoing and it was also found capable of infecting the stem and awns. *S. nodorum* caused chocolate brown spots on the upper half of the glumes. All three organisms were found to be highly specialized on wheat. The Lyallpur species of *Septoria* resembled the Baarn strain of *S. tritici* in all essential respects, only differing very slightly in some minor characters, e.g. the Lyallpur strain grows more slowly in culture, produces less aerial mycelium, generally forms darker colonies on the media tested, has 1- to 4-septate pycnospores instead of 2- to 5-septate (or 2- to 7-septate in culture), and produces conidia in abundance. These differences are of little systematic importance and the Lyallpur strain is identified as a slow-growing strain of *S. tritici*, thus confirming the record by Sydow and Butler of *S. tritici* on wheat collected at Lyallpur in 1905 (*Ann. Myc.*, xiv, p. 214, 1916). *S. nodorum* is regarded as a valid, distinct species.

Foëx (E.) & Rosella (E.). **Un Sclerotium parasite du Blé.** [A *Sclerotium* parasitic on Wheat.]—*Ann. Sci. nat., Bot.*, Sér. X, xix, pp. 221–31, 10 figs., 1937.

A brief account is given of a disease of wheat, which occurred from 1929 to 1931, inclusive, in the Ile-de-France (France), and specimens of which were also received from Morocco. The chief symptom is the development on the host stem or sheath, usually on the first internode from the base, of an oval, colourless spot with a brown margin, and bearing on the surface a hyaline, cylindrical, septate mycelium which in time thickens into slightly darker agglomerations; from the under surface of these, hyphae penetrate the cuticle and the epidermal cell-walls, being markedly constricted at the point of entry. After the death of the host the fungus forms globose or oval, glabrous, at first reddish-brown

and later blackish-brown sclerotia, measuring from 250 to 1,500 or even 2,000 μ, within its tissues. It was readily isolated from the lesions on ordinary media, and produced sclerotia in some 12 days at 20° to 25° C.; it was experimentally shown to be pathogenic to wheat seedlings, rapidly killing those eight days old or less, and producing localized infection on the sheaths or leaves of older ones. In the field attacked plants may either show no difference from healthy ones, or show scalding symptoms together with stunting, and may occasionally lodge. The fungus, no fructifications of which were found in nature or obtained in culture, is considered to be new to science and is named *Sclerotium costantini*, with a Latin diagnosis.

Blair (I. D.). **An investigation of foot rot of Wheat in New Zealand.**— *N.Z.J. Sci. Tech.*, xix, 1, pp. 1–21, 3 figs., 1937.

During the past few years wheat crops in New Zealand have been affected by a widely distributed foot rot causing a wilting and death of the seedlings or a yellowing of the leaves and a check to growth, besides stem and root decay.

In this preliminary study isolations from six soils yielded cultures of *Fusarium*, *Alternaria*, *Penicillium*, and *Rhizopus*, and the two former species being predominant the author confined his attention to these two groups. Comparison of a named culture of *F. culmorum* obtained from Geach [*R.A.M.*, xi, p. 708] with the strains of *Fusarium* isolated revealed a great similarity between the cultures, the differences observed being probably due to the existence of physiologic strains. Pathogenicity tests showed that most of the isolations were as virulent as the authentic strain of *F. culmorum*, two strains only being less vigorous; the isolants caused the death of the shoots soon after germination, stunting of the seedlings, poor root development, and brown lesions on the underground stems, and were successfully re-cultured from the infected plants. Inoculations with three cultures of *Alternaria* gave positive results, but both the *Fusarium* and *Alternaria* isolations are regarded as weak parasites.

Observations in the field showed seedling blight, 'spring yellows', and whiteheads to be present, the last-named symptoms being probably due either to *Fusarium* infection at the crown or to mechanical fracture.

Symptoms of wheat scab were also observed during the 1934–5 harvest, and isolations from diseased glumes and grain yielded cultures of *Fusarium* and *Alternaria* to which the condition is attributed. *Alternaria*, *Cladosporium*, and occasionally *Fusarium* were isolated from grains showing a black discoloration of the germ end and *Cladosporium* from 'black heads' in which the glumes were covered with greenish black specks.

In a survey of 92 wheat crops in Canterbury in 1935 only 11 showed no sign of the disease. Seedling blight was severe in soils of high natural fertility and the more acid the soil the higher was the degree of seedling infection. *Agropyron repens*, perennial rye grass [*Lolium perenne*], and barley grass (*Hordeum*) [*murinum*] were found infected by the pathogen. Foot rot may appear after any crop and continuous growing of wheat did not result in increased infection. In discussing control measures

data are given showing that winter-sown crops are more severely attacked than others, and the deeper sown seed than the shallow sown; there was evidence that the yield of crops showing spring yellows can be improved by top dressing with fertilizers. In seed disinfection experiments treatment with copper carbonate, ceresan, and agrosan improved germination from 77·8 per cent. in the inoculated control to 83·8, 81·8, and 80·6 per cent., respectively.

Hynes (H. J.). **Species of Helminthosporium and Curvularia associated with root rot of Wheat and other Graminaceous plants.**—*J. roy Soc. N.S.W.*, lxx, pp. 378–391, 1 pl., 3 figs., 1937.

The author discusses all the species of *Helminthosporium* that have been found in association with root rot of wheat, viz., the large spored species *H. bicolor* [*R.A.M.*, x, p. 758], *H. halodes* var. *tritici* [loc. cit.], *H. pedicellatum* [ibid., iv, p. 408; xii, p. 782], *H.N.* of Henry [ibid., xiv, p. 611], and *H. sativum* [ibid., xiv, p. 622] and the small-spored *H. tetramera* (*Curvularia spicifera*) [loc. cit.] and *H.M.* (*C. ramosa*) [loc. cit.]. The three last-named occur in Australia. *H. sativum* has been isolated from wheat, oats, barley, rye and several grasses and has been obtained from all States excepting Tasmania; there is no doubt it is the predominant large-spored species associated with wheat root rot throughout Australia. *C. spicifera*, with conidia measuring 23·5 to 25 by 8·5 to 9 μ, occurs on wheat, oats, barley, and rye in New South Wales but is not important pathogenically; *C. ramosa*, with conidia averaging 32·6 by 13·0 μ and 35·3 by 13·3 μ for two strains, respectively, occurs on wheat, oats, barley and various grasses, and has been recorded from New South Wales, Victoria, and South Australia; certain strains of this species are stated to be extremely virulent to cereal seedlings.

Pittman (H. A.). **Take-all and similar diseases of Wheat and how to control them.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xiv, 2, pp. 103–112, 4 figs., 1937.

A popular account is given of take-all (*Ophiobolus graminis*) [*R.A.M.*, xvi, p. 523] and foot rot (*Helminthosporium sativum*) [ibid., xvi, pp. 231, 524] of wheat, which during recent years have become the most serious diseases of the crop in Western Australia, the three-year rotation system (fallow, wheat, pasture) practised in many parts of the wheat belt tending to increase infection in succeeding wheat crops, and many farmers failing to resort to systematic control methods. *O. graminis* is most prevalent in warm, moist periods during spring on old land sown to wheat continuously, and is especially common in wet, badly drained localities, or where a field has been allowed to grow into grass. It is uncommon and need never be feared on well-managed farms. *H. sativum* is not yet widely present locally. *Wojnowicia graminis* [ibid., xiv, p. 569; xv, p. 566] has been found on wheat and barley grass (*Hordeum murinum*) but its parasitism is questionable.

Recommended control methods (designed to starve out the fungi and improve the growth of the host) comprise in addition to those already noted [ibid., xi, p. 567] sowing after the beginning of the autumn rains, late planting of an early maturing variety on land where heavy losses have occurred, avoidance of the practice of feeding-off the crop

on affected land, of allowing affected paddocks to go to pasture, and of placing bags of wheat or chaff in bare patches caused by the disease, and cutting infected crops for hay at not less than 4 or 5 in. from the ground.

Samuel (G.). **Whiteheads or take-all in Wheat.**—*J. Minist. Agric.*, xliv, 3, pp. 231–241, 3 pl., 1937.

Many severe outbreaks of take-all of wheat (*Ophiobolus graminis*) [see preceding abstract], which has become increasingly prevalent on the lighter soils of Norfolk, Hampshire, and the Yorkshire Wolds, result from ploughing up a slightly diseased stubble, the new roots reaching the infected material before it has rotted away. The ploughing-in of apparently healthy grass, in the roots of which the fungus may live for years, may have a similar result. The data so far obtained from a systematic study at Rothamsted indicate that in the moisture conditions prevailing in English soils the fungus cannot persist for a year if the stubble has been ploughed under. Wheat may safely be sown early on land left fallow for several months or planted to a non-cereal, but after a previous wheat crop stubble should be ploughed in early, and the seed sown late.

Dissemination by wind-borne spores may occur when infected stubble is left untouched, but as spore ejection occurs only during or immediately after rain it is improbable that large numbers of spores are carried more than a few hundred yards, and the majority are unlikely to reach growing roots that they can infect. If, however, the prevailing winds did carry spores over young cereal crops on light soils many would be washed down into contact with the roots.

When wheat becomes affected the source of infection should if possible be determined in order to prevent a recurrence. If other factors do not intervene, infection from mycelium in the soil generally produces definite patches of disease, sometimes evenly distributed over the field, while spore infections produce individual diseased plants scattered throughout the crop and becoming progressively fewer with increasing distance from the source of infection.

The disease is more severe on light or alkaline soils or those poor in organic material than on heavy or acid soils or those rich in organic material. Dung dressings may reduce infection. Unless the soil is distinctly acid preference should be given to sulphate of ammonia rather than the more alkaline nitrate of soda or nitro-chalk as a nitrogenous dressing. Red wheats are more resistant than white, but may be badly attacked. Barley is moderately susceptible, and although oats are almost immune in Australia, they occasionally become infected in England owing to the wetter climate. Rye grasses (*Lolium* spp.) are very resistant. Measures recommended for control include early ploughing-in of stubble, crop rotation, appropriate manuring, and cultivation of light soil fallows to destroy grasses and to make a firm seed-bed.

Adam (D. B.) & Colquhoun (T. T.). **Barley diseases in South Australia and their control.**—*J. Dep. Agric. S. Aust.*, xl, 10, pp. 787–792, 1 fig., 1937.

After briefly referring to the diseases of barley occurring in South

Australia the authors record the discovery of leaf stripe (*Helminthosporium gramineum*) on the crop for the first time in the State, where the disease has probably been present for some years. In experiments on the control of covered smut of barley (*Ustilago hordei*) in 1935, treatment by formalin sprinkle (1 in 320) or formalin steep (1 in 400 for 30 minutes) reduced the percentage of smutted plants from 5·8 in the control to 2·1 and 0·2, respectively, while dusting with copper carbonate (2 oz. per bush.) reduced it to 1·2 and treatment with ceresan U.T. 1875 A and agrosan G eliminated the disease entirely. In tests in 1936, complete control was again given by ceresan U.T. 1875 A and agrosan 13536. Experiments on the control of barley stripe in 1936 showed that ceresan U.T. 1875 A and agrosan 13536 were effective while formalin sprinkle (1 in 320) and copper carbonate partially controlled the disease.

Allison (C. C.). **Studies on the genetics of smuts of Barley and Oats in relation to pathogenicity.**—*Tech. Bull. Minn. agric. Exp. Sta.* 119, 34 pp., 8 figs., 1 diag., 1937.

In this account of a study made in Minnesota of the genetics of barley and oats smuts (*Ustilago* spp.) in relation to pathogenicity the author states that the partial vacuum method of barley seed inoculation [*R.A.M.*, xvi, p. 595] with chlamydospores of *U. hordei* and *U. medians* gave much better results than dusting and was also more satisfactory for inoculating barley or oat seeds with monosporidial combinations.

The results obtained [which are tabulated and discussed] showed that collections of *U. hordei* differed from one another in their virulence on 11 barley varieties, 27 out of 28 collections being differentiated on 6 out of the 11 varieties, while 3 collections were further differentiated on Minnesota No. 474 barley, grown in the greenhouse, on a basis of the type of smutted plant produced. Factors for sex of *U. hordei* and *U. medians* segregated in the ratio of 2:2, while those for cultural characters in *U. hordei* segregated in the ratios of 3:1, 2:2, and 0:4, independently of the factors for sex. Variants differing culturally from the parent colonies were observed.

From investigations on the hybridization of *U. hordei* and *U. medians*, some results of which have been noticed from another source [ibid., xiv, p. 352], it was found that the two species hybridized readily with each other as shown by sporidial fusion and the production of viable chlamydospores. Combinations of head type and chlamydospore wall markings different from either parent type were observed in the F_2, and segregation for pathogenicity occurred in the F_2 dicaryophytes, some of which were more pathogenic than the parent dicaryophytes on some barley varieties.

U. hordei and *U. medians* hybridized with *U. avenae*, *U. levis*, and *U. tritici* to the extent of fusions and initiation of the dicaryophase, but seed inoculations with these combinations failed to produce smutted heads, and no smut hyphae were noted in the seedlings. The nuclear condition of the sporidial fusions differed very little in intra- and interspecific crosses. The dicaryophase was initiated shortly after fusion when the two nuclei became associated in the same sporidium. When the chlamydospores of *U. hordei* germinated beneath the hull of the

seed they typically produced a promycelium, the cells of which fused readily, the resultant nuclear condition resembling that of fused sporidia. The mycelium of *U. hordei* was predominantly dicaryotic in the host, but cells with one nucleus or more than two nuclei were observed in many hyphae.

Rainio (A. J.). **Kauralaatujen punahome-Fusarium-roseum Link—Gibberella saubinetii (Mont.) Sacc. kestävyydestä.** [The resistance of certain varieties of Oats to *Fusarium roseum* Link—*Gibberella saubinetii* (Mont.) Sacc.]—*Valt. Maatalousk. Julk.*, 92, 24 pp., 2 figs., 3 graphs, 1937. [German summary.]

The writer tabulates and discusses the results of his studies in 1933–4 on the reaction to *Gibberella saubinetii* [*R.A.M.*, xvi, p. 665] of 137 varieties of oats, the seed-grain of which was inoculated before sowing with conidial suspensions of the fungus [ibid., xiii, p. 157]. All the naked oats used in the tests were found to be very susceptible, the average incidence of infection for the group being 17·8 per cent. as compared with 6·9 per cent., for those provided with glumes. The average percentages of infection for the varieties with yellow, white, grey, and black glumes were 6·1, 6·9, 6·8, and 3·2, respectively. Varieties with open sutures, which facilitate the admission of the hyphae to the caryopses through the fissures between the outer and inner glumes, such as Simo and Esa, are in general more severely attacked by *G. saubinetii* than those with semi-closed (Osmo II and Kytö) or closed ones, e.g., Early Mountain, the incidence of infection in which was only 0·3 per cent. The average percentages of infection among the early varieties with open and semi-closed sutures were 4·2 and 3·4, respectively, the corresponding figures for the medium-early group being 7·2 and 4·2, for the medium-late 8·4 and 5·3, and for the late 10·3 and 6·0, respectively. Early varieties tend to be more resistant to *G. saubinetii* than late ones, the infection percentages for the early, medium-early, medium-late, and late groups being 3·6, 4·7, 6·9, and 8·4, respectively. Resistance to the fungus would thus appear to depend primarily on the interaction between earliness and the character of the suture.

Kornfeld (A.). **Bekämpfung des Maisbeulenbrandes auf biologischer Grundlage.** [Control of Maize smut on a biological basis.]—*Z. PflKrankh.*, xlvii, 5, pp. 277–297, 1937.

A comprehensive, tabulated account is given of the writer's experiments, in progress in Rumania since 1925, in the control of maize smut (*Ustilago zeae*) [*R.A.M.*, xvi, p. 448] on lines dictated by a study of the biology of the pathogen.

The optimum temperature for the development of the smut was found to lie between 20° and 25° C. according to its locality of origin. The reaction of the fungus to acids is of importance from the silage standpoint; the strongest inhibitory action on spore germination was exerted by butyric and the weakest by lactic acid (16·20 and 52·23 per cent. germination, respectively, in the presence of 2 per cent. concentrations), citric and acetic acids being intermediate in this particular (35·27 and 30·14 per cent. germination, respectively). The preference of the

local (Mediasch, Transylvania) peasantry for the lactic acid type of silo fermentation is therefore not altogether desirable.

Infection was experimentally shown to take place primarily through wounds, though the entry of the spores may also be effected by way of the stomata. When inoculations were made through the root-collar, 10·4 per cent. of the smut boils were formed at the site of infection, 43·5 per cent. on the stem, 5·8 per cent. on the leaves, 6·4 per cent. on the cob, and 6·4 per cent. on the male panicles, the corresponding figures for inoculation at the third stem node being 12·0, 26·4, 14·3, 32·1, and 3·5 per cent., respectively.

Observations from 1928 to 1930 showed that severe infection may be expected to follow a mean June temperature exceeding 20°, while hailstorms are liable to increase the percentage of smut. Laboratory experiments showed that the fungus is incapable of withstanding the high temperatures occurring in fermenting farmyard manure. The results of field experiments indicated that well rotted manure is preferable to fresh, but nitrogen in any form should only be used sparingly.

The results of varietal reaction tests showed Canadian and Ninety Day to be virtually immune under local conditions at Mediasch; Fodder Sugar, Szekler, and Yellow Baden resistant; Queen of the Prairie, Gold Maize, Bankut, and Janetzki's Early moderately susceptible; and King Ferdinand and Timar's Pearl highly so.

A distance of at least 80 cm. should separate the maize rows, and strict precautions must be taken to avoid injuring the plants in the course of hoeing and other cultural operations. Maize should not be sown before the soil temperature reaches 10° (about 5th May in Transylvania in 1930); the infection percentages for the stands sown on 15th and 25th April, 5th, 15th, and 25th May, and 5th June being 31·50, 24·17, 20·65, 23·00, 16·83, and 14·29, respectively. The incidence of smut in plants raised from seed-grain taken from the middle of the cob was 8·58 per cent., compared with 12·19 for that from the base and tip, and 14·03 for damp and mouldy seed-grain. Experiments from 1925 to 1930, inclusive, showed the advantage of seed treatment with uspulun, the soil of the test plots being repeatedly dusted with ceresan to avoid external contamination. The spores of *U. zeae* were found to retain their viability (10 to 25 per cent.) for eight years in pure sand at a depth of 20 cm.; at 10 cm. 50 per cent. were viable after five years, and 100 per cent. after three years. In loam, clay, and humus there was a progressive diminution of viability, the last-named virtually inhibiting germination after the sixth year. It was shown by a test in which maize was grown in succession to maize for five consecutive years that the incidence of smut rose from 5·88 in the first to 43·08 per cent. in the fifth year, the corresponding figures for a control plot under rotation being 6·07 and 19·50 per cent., respectively. The boils should be cut out and burnt at an early stage in their development, preferably before spore formation commences in the interior.

McNew (G. L.). **Crown infection of Corn by Diplodia zeae.**—*Res. Bull. Ia agric. Exp. Sta.* 216, pp. 191–222, 7 figs., 1937.

A detailed study of crown infection of maize by *Diplodia zeae* [*R.A.M.*, xvi, p. 245] showed that the symptoms include a dark straw-

brown discoloration of the tissues of the crown and lower internodes, the presence of subepidermal pycnidia on the crown and round the aerial adventitious roots, the disintegration and shredding of the internal tissue of the crown, an intense brown discoloration of the nodal plates, and a dark brown decay of the mesocotyl, causing loss of the primary roots. From 1930 to 1933 this condition affected 14 to 52 per cent. of the field-grown maize in central Iowa.

Plants grown in infested soil from clean seed show the same symptoms as those from infected seed. The fungus grows through the soil, establishing itself in the wounds made in the mesocotyl by the emerging seminal roots. The crown may be directly invaded in this way, but as a rule is infected from the mesocotyl, the mycelium spreading slowly in the host during the growing season, but rapidly affecting the whole crown and lower nodes at maturity. The fungus, however, is not systemic, and is usually confined to the first internode above the roots.

Crown infection was induced by infecting steamed soil with parts of diseased plants that had overwintered in the field. The fungus was able to live in soil not containing plant refuse, but growth was hindered in mixed culture.

Invasion of the crowns from infected soil was most severe at high soil moistures, but the development of the diseased plants was greatly reduced at high and low soil moistures, while crown infection failed to reduce the dry weight of maize grown at the optimum soil moisture. The dry weight of roots in infected soil showed greater reduction than the tops, and light infections in low soil moisture were sometimes almost as injurious as heavy infections in abundant soil moisture. The transpiration ratio of diseased plants was increased at soil moistures favourable to the reduction of dry weight.

Plants grown from infected seed treated with a mercury dust containing 4·2 per cent. mercury white precipitate (mostly NH_2HgCl) had more crown infection than plants from untreated diseased seed, but the treatment of clean seed with the same dust reduced crown infection from 12·4 per cent. in the untreated to 9·8 per cent. in 1930 and from 58·4 to 47·7 per cent. in 1931, the dusting apparently only inhibiting, not killing, the fungus. The amount of crown infection under given conditions depends on the time of the initial infection; by delaying mesocotyl invasion from infected soil the treatment of clean seed may decrease crown infection.

Late crown infection is a significant phase of the infection of maize by *D. zeae*, the dry weight of the affected plants being halved under certain soil conditions and the yield reduced even when the soil factors are highly favourable. Some selfed lines of maize showed striking resistance to the disease.

Elliott (Charlotte), Melchers (L. E.), Lefebvre (C. L.), & Wagner (F. A.). **Pythium rot of Milo.**—*J. agric. Res.*, liv, 11, pp. 797–834, 21 fig., 1 graph, 1937.

This is a detailed report of the authors' investigations on the root rot of milo sorghums caused by *Pythium arrhenomanes*, partial accounts of which have already been noticed from other sources [*R.A.M.*, xv, p. 435; xvi, p. 33]. In addition to the information already imparted,

it is stated that the fungus has been shown by inoculation experiments to be actively parasitic on milo roots and also to attack sugar-cane and yellow dent maize. The disease is readily transmitted by mixing small quantities of infected soil or infected host material, with non-infected soil, or by soil water leachings from infested fields. It was further shown that *P. arrhenomanes* remains active in the soil for at least four years and was not controlled by ordinary rotations or fallow. Soil sterilization by steam, formaldehyde, and acetic acid is effective against the disease, but is not considered practicable.

Yu (T. F.). **Further studies on the kernel smut resistance in Millet.**—*Chin. J. exp. Biol.*, i, 3, pp. 235–240, 1937.

In attempts to discover promising lines of millet [*Setaria italica*] resistant to kernel smut [*Ustilago crameri*: *R.A.M.*, xvi, p. 159] inoculation and yield tests were carried out at Nanking and in all the chief millet-growing regions in China from 1932 to 1936 inclusive, with millets obtained from the materials reported in 1930 [ibid., x, p. 238], selections from them, pure-line millets provided by the co-operative stations, and head selections made by the author in Hopeh, Shantung, and Honan Provinces in 1932.

The results obtained [which are tabulated] showed that Nanking Nos. 18, 60, 61, and 65 to 77, inclusive, remained unaffected throughout the tests, while Pathology Nos. 2 and 8, and Nanking Nos. 63, 78, and 80 had under 1 per cent. infection. The slight variation in susceptibility indicates a varietal difference in smut reaction. Pathology Check was badly infected in all localities, while Nanking No. 79 was moderately resistant. Nanking No. 35 remained unaffected by the Nanking strain of the smut, but was slightly though uniformly infected by the Tsinan and Kaifeng strains. Nanking No. 47 remained unaffected by the Tsinan strain, but was susceptible to strains from Peiping. These results indicate a difference in the pathogenicity of the smut strains but the existence of biologic races cannot be regarded as definitely established on the data available at present.

In yield tests of these millets many showed promising results, especially the resistant types Pathology Nos. 2 and 8 and Nanking Nos. 63, 78, and 80. Yield was markedly affected, however, by environmental conditions and in attempts to develop smut-resistant millets it is better to make thorough tests of local lines than to use selections from other localities, where the conditions may be different.

Jensen (J. H.). **Chlorosis of Citrus in Puerto Rico.**—*Phytopathology*, xxvii, 6, p. 731, 1937.

Porto Rico grapefruit trees are liable to a condition closely resembling the disorder known in California as 'mottle leaf' [*R.A.M.*, xvi, p. 669] and in Florida as 'frenching' [ibid., vii, p. 441]. In Porto Rico this chlorotic condition has been found exclusively on alkaline soils (P_H 8 to 8·5). Promising results in its control have been obtained by the application to five-year-old trees of aqueous solutions of zinc sulphate [ibid., xvi, p. 605], which induced refoliation and a return of the normal green colour.

Stahl (A. L.) & Camp (A. F.). **Cold storage studies of Florida Citrus fruits. I. Effect of temperature and maturity on the changes in composition and keeping quality of Oranges and Grapefruit in cold storage.**—*Bull. Fla agric. Exp. Sta.* 303, 67 pp., 9 figs., 2 diags., 2 graphs, 1936. [Received September, 1937.]

In storage experiments on Valencia and Pineapple oranges in Florida, an insignificant amount of storage pitting [*R.A.M.*, xvi, p. 528] occurred at all temperatures but the trouble was slightly more noticeable at the colder temperatures and on the Pineapple variety. Decay (chiefly *Diplodia natalensis* and *Phomopsis* [*Diaporthe*] *citri*) increased with the raising of the storage temperature and with prolongation of the storage period. Fruit kept best at 32° and 37·5° F. but that stored at the latter temperature remained marketable longest on removal to room temperature.

Silver Cluster and Marsh Seedless grapefruit showed severe pitting at 32° and 37·5° after several weeks storage but in fruit held at 54° and 58° pitting was never severe until after the lapse of three or four months. The amount, severity, and rapidity of decay varied directly with the temperature; it was almost negligible at 32° and 37·5° but very severe at higher temperatures in both varieties. Fruit stored at 37·5° and 42° remained marketable longest after removal from storage, and the former temperature is recommended for unwrapped, untreated fruit.

Stahl (A. L.) & Fifield (W. M.). **Cold storage studies of Florida Citrus fruits. II. Effect of various wrappers and temperatures on the preservation of Citrus fruits in storage.**—*Bull. Fla agric. Exp. Sta.* 304, 78 pp., 23 figs., 1936. [Received September, 1937.]

The effects of 22 different wrappers on Pineapple and Valencia oranges and Silver Cluster grapefruit at storage temperatures varying from 32° to 58° F. are described. The S.S.T. and S.A.T. grades of cellophane, and No. 88 regular kodapak wrappers (all semi-moisture proof) gave the best results in controlling pitting [see preceding abstract] in oranges but were closely followed in order of effectiveness by oiled and waxed papers and then by the moisture-proof wrappers. Fruit in a number of other wrappers showed less pitting than unwrapped fruit. Temperature and not wrappers was the factor controlling pitting, the amount of pitting decreasing with an increase in temperature. Pineapple oranges showed considerable pitting after one month's storage, especially at the lower temperature whereas Valencias showed practically none after five months. The best storage temperature for both varieties was 37·5°.

The amount of decay (chiefly *Diplodia natalensis* and *Phomopsis* [*Diaporthe*] *citri*) in oranges varied directly with the storage temperature, length of storage, and moisture retentiveness of the wrapper; decay was negligible at temperatures below 42°, but at this temperature and above it was high in both varieties. No outstanding difference in the control of decay was manifest among the wrappers used.

Pitting was much more severe in grapefruit than in oranges but temperature and not wrappers was again the controlling factor, pitting being severe at the colder temperatures. The moisture-proof cellophane and aluminium foils, with the wet waxed paper proved most effective

in reducing or retarding pitting. Wrapped fruit averaged less pitting than unwrapped, but tissue wraps had little effect.

The efficacy of wrappers in preventing grapefruit decay varied with the different temperatures, no one wrapper being consistently good or bad at all temperatures. Decay was directly correlated with temperature, the higher temperatures causing higher percentages of decay. The best storage temperature for all varieties was 37·5°; above this temperature decay was much more prevalent while below it pitting was more severe. The box liner was as efficient as the individual wrapper in all respects except the prevention of 'nesting' (the condition in which an organism spreads from one fruit to all fruits in contact with it). Taking general appearance, loss in weight, and all other factors into consideration, the most efficient wrapper was plain aluminium foil, followed by M.T. cellophane, moisture-proof sylphrap, and kodapak. Fruit wrapped in moisture-proof wrappers and held at 37·5° kept best after removal from storage.

Ajon (G.). **Studii sul malsecco degli Agrumi.** [Studies on mal secco disease of Citrus.]—*Ann. Staz. Agrum. Frutt. Acireale*, xiv, pp. 1–136, 7 graphs, 1937.

In this collection of papers, published originally at various times between 1930 and 1936, the author gives a detailed account of his investigations into various chemical aspects of mal secco disease of lemons (*Deuterophoma tracheiphila*) [*R.A.M.*, xvi, p. 527] and in particular of the disturbance in mineral nutrition shown by affected trees (calcium and magnesium deficiency with excess of iron and acids). He considers that resistance depends mainly on the ability of the tree to elaborate certain chemotropically negative substances which neutralize the effects of the metabolism of the fungus, which in turn depends on balanced mineral nutrition. A thorough search should be made both locally and in India [ibid., xv, p. 361] for resistant types of lemon suitable to Sicilian conditions. Remedial measures based on improved cultural practices are indicated.

Wardlaw (C. W.). **Storage and transport of tropical fruits and vegetables.**—*Trop. Agriculture, Trin.*, xiv, 5, pp. 131–139, 1937. **Tropical fruits and vegetables. An account of their storage and transport.**—ibid., xiv, 6, pp. 163–170, 1937.

In these contributions the author gives a general account of the behaviour of citrus fruits in storage and transport, with full references to an extended bibliography of 114 titles appended to the second paper. Wastage in citrus is divided into two categories (i) blemishes and (ii) fungal rotting, and these aspects are discussed under the appropriate sections of the paper, the whole subject being treated under the headings of (1) pre-storage, including grove sanitation, picking, quailing, conservation of moisture, packing-shed treatments (including chemical treatments), skin blemishes, maturity tests and export regulations, and pre-storage delay, and (2) storage, comprising non-refrigerated transport, humidity in the storage room, storage temperatures, chilling, prolonged storage, delayed picking, and gas storage, and culture, production, and storage quality. Practically all the work mentioned of phytopathological importance has been noticed in this *Review*.

Winston (J. R.). **Harvesting and handling Citrus fruits in the Gulf States.**—*Fmrs' Bull. U.S. Dep. Agric.* 1763, 37 pp., 20 figs., 1937.

In this account of the factors governing the merchantable condition of citrus fruits in the Gulf States and of the relation between harvesting and handling methods and the maintenance of the fruit in good condition, notes are given on the principal organisms causing decay and their control. Blue and green moulds (*Penicillium italicum* and *P. digitatum* [*R.A.M.*, xvi, p. 601], respectively) are the most widespread, occurring chiefly in the cooler months, temperatures of 50° to 70° F. being most favourable for their development. Fruit exposed to the high temperatures required in the ethylene colouring process (80° to 85°) is less liable to mould as the fungi responsible do not long survive at such temperatures. Stem-end rot (*Diplodia natalensis* and *Phomopsis* [*Diaporthe*] *citri*) is a serious problem in Florida [ibid., xv, p. 797], under favourable conditions causing heavy losses ten days to a fortnight after harvest; losses may be reduced by treating the fruit with an 8 or 10 per cent. borax solution on arrival at the packing-house, careful colouring (de-greening), and prompt packing, followed by immediate refrigeration. *Colletotrichum* [*gloeosporioides*] is usually comparatively unimportant. Antiseptics were ineffective in controlling the condition, and refrigeration appears to be the best means of retarding its appearance. Brown rot (*Pythiacystis*) [*Phytophthora citrophthora* and *P. parasitica*: ibid., xiii, p. 25; xvi, pp. 312, 603] is very seldom serious locally, while blossom-end rot (*Alternaria citri*), though very prevalent, is also generally unimportant.

Santini (P.). **Contribution d'un médecin à l'étude du bayoudh, maladie du Palmier-Dattier.** [A doctor's contribution to the study of the 'baïoudh' disease of the Date Palm.]—*Arch. Inst. Pasteur Algér.*, xv, 2, pp. 271–276, 1 pl., 1937.

From date palms suffering from the 'baïoudh' disease in the oases of Foggaret ez Zoua and Hassi el Hadjar, Sahara, the writer isolated a fungus identified by Malençon as *Fusarium albedinis* [*R.A.M.*, xvi, p. 34]. According to native statements the disease in the former locality dates from the commencement of French occupation in 1900, assuming an epidemic character in 1910 and again in 1922, since when there have been successive serious outbreaks, reducing the number of trees in one garden from 6,000 to 200. At Hassi el Hadjar the first case was observed two years ago and at the time of inspection 37 palms were involved. Infection is believed to have been conveyed on an instrument for cutting the palms from Foggaret ez Zoua. In both localities the Tgaza variety is the most susceptible, Takerboucha being apparently immune. Cases of spontaneous recovery from 'baïoudh' have been observed, starting with the young fronds and progressing downwards.

Orian (G.). **Notes préliminaires sur une maladie du Palmier à Maurice, causée par le Bacterium vasculorum (Cobb) Gr. Smith.** [Preliminary notes on a Palm disease in Mauritius caused by *Bacterium vasculorum* (Cobb) Gr. Smith.]—*Rev. agric. Maurice*, 93, pp. 100–101, 1937.

The bacterium isolated from heart rot of white palms (*Dictyo-*

sperma album) in Mauritius [*R.A.M.*, xvi, p. 516] and re-isolated from inoculated plants of the same host and maize was found to show the morphological and physiological characters of *Bacterium vasculorum*, this identification being confirmed at the Imperial Mycological Institute. Inoculations with the organism on sugar-cane leaves resulted in the development of characteristic symptoms. The disease causes rotting of the main rib of the leaves of *D. album* followed by a gradual drying-up of the plant. A yellowish gum is exuded by the vascular bundles of the trunk.

Monsma (E. Y.). **A study of the water molds of the Lydell State Fish Hatchery at Comstock Park, Michigan.**—*Pap. Mich. Acad. Sci.*, xxii, pp. 165–182, 1937.

In an investigation of the water mould content of the Lydell State Fish Hatchery, Michigan, *Saprolegnia parasitica* [*R.A.M.*, xii, p. 93] was isolated 34 times from water and soil, and from September to January; *S. ferax*, 17 times; and 12 other species of *S.* from one to four times each. The streams supplying the Hatchery were highly contaminated and constituted the source of infection of the ponds and soil. The results of inoculation experiments showed that *S. parasitica*, *S. ferax*, and *S. diclina* and possibly some other species are capable of infecting the membranes of living fish eggs but were not parasitic on the fry of fish. *S. parasitica* and possibly other species were shown to infect older fish at injured points, causing death. The eggs were infected by means of zoospores as well as by hyphae and the best method known at present to keep the fungi under control is periodic draining and cleaning of the ponds.

Kevorkian (A. G.). **Studies in the Entomophthoraceae. I. Observations on the genus Conidiobolus.**—*J. Agric. P. R.*, xxi, 2, pp. 191–200, 3 pl., 1937.

A comparative study is described of *Conidiobolus villosus* isolated from living termites placed in damp chambers for observation in Cuba with strains obtained from the Farlow Herbarium and the Centraalbureau voor Schimmelcultures, [Baarn], Holland. Infection experiments showed that the fungus, hitherto considered a saprophyte, can become parasitic, especially on termites, though the Dutch strain appeared to be strictly saprophytic. An additional stage in the life-history of the fungus is constituted by minute conidia borne at the tips of spiny appendages of the villose conidia or 'resting spores' similar to those of *Delacroixia coronata*, with which *C. villosus* is regarded as synonymous. The genus *Delacroixia*, based on the microconidia, is not regarded as sound and the species is transferred to *Entomophthora* as *E. coronata*, the genus *Empusa* being illegitimate as it was used in 1824 for a genus of orchids.

Dickson (E. C.). **Coccidioides infection: part I.**—*Arch. intern. Med.*, lix, 6, pp. 1029–1044, 4 figs., 1937.

This is the first of a series of reports based on a study of infection by *Coccidioides immitis* [*R.A.M.*, xvi, p. 611] in California, supplemented

by particulars of intensive experimental work conducted in the Department of Public Health and Preventive Medicine, Stanford University, during the past few years and by references to the relevant literature. Clinical observations are cited to show that the accepted description of coccidioidal granuloma is that of the advanced or terminal stages of an infection which is not commonly recognized in its acute phase. Evidence is adduced for the development of primary infection following the inhalation of chlamydospores of the fungus, leading to bronchopneumonia and erythema nodosum. The article concludes with a full account of cultural and inoculation studies of the fungus, the results of which correspond in general with those described by previous investigators.

Catanei (A.). **Description de deux nouvelles espèces et d'une variété nouvelle de champignons provoquant des teignes chez l'homme.** [Description of two new species and a new variety of fungi causing ringworms of man.]—*Arch. Inst. Pasteur Algér.*, xv, 2, pp. 265–270, 2 pl. (1 col.), 1937.

During 1936 the writer isolated from human hair two new species of *Trichophyton* of the endothrix group and a new variety of *T. glabrum*. *T. pervesi* n.sp., responsible for three juvenile cases of ringworm in the Adrar region of the Sahara, formed on Sabouraud's glucose agar smooth, greyish-yellow colonies, which gradually assumed a purple tinge spreading outwards from the centre, the latter being surrounded by a white velvety ring. The periphery was composed of delicate rays in close proximity. On agar without sugar the colonies are smooth, irregularly plicate, with greyish-white, powdery or velvety, sulcate edges, while a downy, greyish-white or purple-tinged growth develops on barley or rice grains. On Sabouraud's agar numerous simple conidiophores of the *Acladium* type are produced with readily detachable conidia, the smooth portions of the colony yielding only chlamydospores. On natural substrata the conidiophores are furnished with one or more branches, and bear densely aggregated piriform conidia, 3 to 3·5 by 2 to 2·5 μ. Positive results were obtained in inoculation tests on guinea-pigs.

T. radicosum n.sp., isolated from the scalp of a 12-year-old Greek boy in Athens, forms on glucose agar a smooth, white growth not exceeding a pin's head in size, surrounded by an ill-defined zone of frosted aspect, with a whitish border or radiating, submerged hyphae. On maltose agar the central protuberance may attain a diameter of 2 mm., encircled by a smooth, greyish-white, irregular disk, 6 to 8 mm. in diameter. On rice agar the whitish, downy growth may reach a diameter of 6 to 8 mm. On agar media *T. radicosum* produces only arthrospores and chlamydospores, but on natural substrata *Acladium*-like conidiophores are frequently formed in profusion, bearing at fairly wide intervals piriform conidia, 4·5 to 5 by 2 to 2·5 μ. Guinea-pigs reacted positively to inoculation with the fungus.

T. glabrum var. *fuscinum* n.var., also originating in the scalp of a Greek child in Athens [ibid., xvi, p. 383], differs from the type species in the production on sugar-containing and natural media of a brown pigment. On natural media the *Acladium*-like conidiophores bear piri-

form conidia measuring 4·5 to 5 by 2 to 2·5 μ. Negative results were given by inoculations on guinea-pigs.

Petges (G.) & Lecoulant (P.). **Teigne d'origine africaine (région du Tchad) chez un enfant de 22 mois à parasite rappelant le "Microsporon ferrugineum d'Ota". Essai d'identification.** [Ringworm of African origin (Chad region) in a 22-month-old infant due to a parasite resembling Ota's *Microsporon ferrugineum*. An attempt at identification.]—*Ann. Derm. Syph., Paris*, Sér. 7, viii, 6, pp. 447–457, 7 figs., 1937.

Clinical details are given of a case of ringworm of the hair in a 22-month-old French boy, who contracted the disorder from native children in the Lake Chad region of Africa. Fragments of the affected hair, which was beaded with large, refringent spores, and squamae gave rise on Sabouraud's agar at 20° to 22° C. at first to a fine, whitish down, then successively to ochraceous-yellow to rust-coloured colonies with a markedly uneven, dry, contorted surface, and to the snow-white, pleomorphic woolly 'duvet'. Moniliform hyphae composed of unequal, elongated, rounded, ovoid, or elliptical segments were present. The pleomorphic 'duvet' consists of a regular, septate mycelium, some of the hyphae of which bear simple bunches of aleuria, while others present the phenomenon of protoplasmic resorption. The fungus presents interesting analogies both with *Trichophyton ochraceum* [*R.A.M.*, xv, p. 219] and more particularly with *Microsporon ferrugineum* [ibid., xv, pp. 501, 580].

Emmons (C. W.) & Carrión (A. L.). **Sporulation of the Phialophora type in Hormodendrum.**—*Mycologia*, xxix, 3, pp. 327–333, 6 figs., 1937.

Discussing the cause of chromoblastomycosis [*R.A.M.*, xv, p. 220] the authors state that the disease may be occasioned by any of three species of fungi, viz., *Phialophora verrucosa*, *Hormodendrum pedrosoi*, both long known as the commonest agents of the disease, and *H. compactum*, isolated from a single case in Porto Rico. The fungus named by Moore *Phialoconidiophora guggenheimia* [ibid., xvi, p. 251] is a typical strain of *H. pedrosoi* and the new name is another synonym of that species.

Sporulation in *H. pedrosoi* is more restricted than in saprophytic species of the genus and conidiophores of the *Phialophora* type occur but rarely [ibid., xv, p. 220] but are similar in every way to those of *P. verrucosa*. Sometimes a *Hormodendrum* spore in an otherwise normal head is transformed by the rupture of the end wall into a conidiophore of the *Phialophora* type. The series of changes by which such a transformation may take place are discussed and it is considered probable that *P. verrucosa* arose as a mutant from some species of *Hormodendrum*. Though in *Phialophora* the spores function as conidia the possibility that spores of this type are spermatia is not to be overlooked. For the present the authors recommend the retention of these fungi in *Hormodendrum* instead of transferring them to *Cladosporium*.

Niizawa (S.). **Ueber die Dermatomykosen in der Holonbail Gegend von Mandchuokuo.** [On the dermatomycoses in the Holonbail region of Manchukuo.]—*J. orient. Med.*, xxvi, 6, pp. 1175–1191, 1 pl., 11 figs., 1 map, 1937. [Japanese, with German summary.]

During a fortnight's stay in the Holonbail mountains of Manchukuo in 1935 the writer determined the causal organisms in 19 cases of dermatomycosis [cf. *R.A.M.*, xv, p. 501], viz., *Trichophyton violaceum* in 11, *T. purpureum* [ibid., xvi, p. 101] and *Microsporon japonicum* [ibid., xv, p. 459] in 3 each, and *T. glabrum* [ibid., xvi, p. 458] and *Epidermophyton inguinale* [*E. floccosum*: ibid., xvi, p. 316] in 1 each. Favus, mostly due to *Grubyella* [*Achorion*] *schoenleini* var. *mongolica* [ibid., xv, p. 501], is stated to be spreading in the region under observation.

Kambayashi (T.). **Botanische Untersuchungen über japanische Fadenpilze, die auf der Menschenhaut parasitieren. III. Mitteilung. Über Cephalosporium nigrum nov. sp., isoliert von einer Dermatomycosis in Äthiopien.** [Botanical studies on Japanese Hyphomycetes parasitizing human skin. Note III. On *Cephalosporium nigrum* nov. sp., isolated from a dermatomycosis in Ethiopia.]—*Bot. Mag., Tokyo*, li, 606, pp. 436–444, 1 pl., 2 figs., 1937.

Cephalosporium nigrum n.sp., isolated from eruptions on the hands and legs of a Japanese temporarily residing at Addis Ababa, Abyssinia, forms on Sabouraud's glucose agar black, velvety, slightly raised, irregularly furcate colonies, with a whitish-grey centre and a narrow, semi-transparent peripheral zone of the same tinge. On potato the colonies are whitish-grey with a blackish centre. The fungus is characterized by hyphae 2 to 2·5 μ in diameter, and simple conidiophores, 20 to 38·5 by 2·5 μ, from the apices of which are abstricted up to eight or even twelve ovate to ellipsoid, hyaline conidia, 4·4 to 4·8 by 2·8 to 3·5 μ, aggregated into 'heads' 9·5 to 18 μ in diameter. Comparative studies of the new *Cephalosporium* [no Latin diagnosis of which is furnished] and eleven other species of the genus causing human dermatomycoses revealed a close affinity between *C. nigrum* and *C. stuehmeri* [*R.A.M.*, xiii, p. 238], the latter differing, however, in its reddish-brown colonies.

Weedon (F. R.), Shirk (Marie E.), & Kenney (Dorothy). **Monilia albicans infection of the human gall bladder and biliary tract with report on three cases.**—Abs. in *J. Bact.*, xxxiii, 6, pp. 646–647, 1937.

Monilia [*Candida*] *albicans* [*R.A.M.*, xvi, p. 610] was detected by the writers in the bile of three out of 14 cases of typical gall-bladder disease and inoculated into rabbits with positive results.

Agostini (Angela) & Tredici (Vincenzina). **Sopra una nuova specie di micete commensale (Phoma hominis Agostini et Tredici) isolato da forme cliniche del derma.** [On a new species of commensal fungus (*Phoma hominis* Agostini & Tredici) isolated from clinical conditions of the skin.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, ix, pp. 179–189, 5 figs., 1937. [Latin summary.]

A description is given of two strains of a species of *Phoma* isolated

from a dermatosis of the foot at Bari and one of the hand at Milan. In culture on Pollacci's medium and carrot the fungus formed a white, flocculent, later greyish, adherent mycelium and sparse, round, elliptical or irregularly oblong, yellowish to brown, ostiolate pycnidia, 80 to 350 μ in diameter, with hyaline, elliptical, ovate-elliptical, or round spores 2·5 to 12·5 μ in diameter. The elliptical, piriform, or oblong conidia of an *Alternaria* were also present either solitarily or arranged in short chains, measuring 25 to 60 by 5 to 13 μ. The fungus is named *Phoma hominis* n.sp. [cf. *P. conidiogena* on man: *R.A.M.*, xi, p. 374], the *Alternaria* stage being termed *A. hominis* n.sp., both with a Latin diagnosis. Inoculations of laboratory animals gave negative results and the fungus is regarded not as a causative but an aggravating factor in the dermatoses.

Trunoff (G. A.). Матеріали по фітопатологічному вивченню Конопель. [Contributions to the phytopathological study of Hemp.]—ex *Збірник наукових праць по Захисту Рослин* [Collection of scientific papers on Plant Protection], pp. 69–113, 13 figs., 3 graphs, 1 map. Держ. Видавн. Колгос. і Радгос. Літер. УССР. [Ukr. St. Publ. Off. Collect. Co-op. Fmg-Lit.], Kieff, 1936. [Received May, 1937.]

Field surveys from 1930 to 1933, inclusive, showed that the more important fungal diseases of hemp [*Cannabis sativa*] in the Ukraine are a stem spot, the causal organism of which is stated to be *Dendrophoma marconii* [*R.A.M.*, xv, p. 97] in association with a number of saprophytic fungi, and white and grey rots due to *Sclerotinia libertiana* [*S. sclerotiorum*: loc. cit.] and *Botrytis cinerea* [ibid., xiii, p. 377], respectively. Observations in 1930 indicated that the stem spot originates and develops chiefly on the male hemp plants, the infection spreading during vegetation from these to the female plants. It was experimentally shown that removal of the male plants from the fields as early as possible after the completion of pollination significantly reduced the incidence of the disease and also the damage done to the technical qualities of the fibre. *B. cinerea* attacks chiefly the middle and apical portions of the stems and inflorescences. In one locality in 1931 *Diplodina cannabina* was found to cause a wet stem rot of hemp in the field. In the former Proskuroff district up to 23·5 per cent. of the crops were damaged by *Cladosporium herbarum*, which caused a brown discoloration of the fibres, considerably reducing their commercial value. An average of 21·8 per cent. of the hemp plants in three localities were observed to be attacked by *Hypochnus* [*Corticium*] *solani*, a new record on this host; the fungus apparently did not interfere with the development of the plant, but formed a whitish efflorescence of *C. solani* spores at the collar. The leaf diseases mentioned include brown spot (*Phyllosticta cannabis*) [ibid., xi, p. 745], *Septoria cannabis* [ibid., xv, p. 805], downy mildew (*Pseudoperonospora cannabina*) [ibid., xv, p. 97], and a small, dark brown to black, interveinal spotting, occurring especially on Italian hemp varieties, caused by an undetermined bacterium. None of these leaf diseases is of economic importance, but the downy mildew has potentialities for damage.

Воновік (І. V.). Хвороби нових олійних культур на Україні. [Diseases of the newly introduced oleiferous crops in the Ukraine.] —ex *Збірник наукових праць по Захисту Рослин* [*Collection of scientific papers on Plant Protection*], pp. 114–123, 5 figs. Держ. Видавн. Колгос. і Радгос. Літер. УССР [Ukr. St. Publ. Off. Collect. Co-op. Fmg-Lit.], Kieff, 1936. [Received May, 1937.]

The results of a phytopathological survey in 1934 of the oleiferous plants which have recently been introduced for intensive cultivation in the Ukraine showed the presence on them of the following parasitic diseases. Castor bean (*Ricinus communis*) suffers chiefly from grey rot (*Botrytis cinerea*) of the inflorescences; the greatest damage was done to the varieties with dense, compact racemes, and one Siberian (Priamurski) variety with loose bunches was apparently completely immune. Bacterial wilt (*Bacterium solanacearum*) [*R.A.M.*, xiii, p. 659; xv, p. 539] was met with only occasionally.

The most severe diseases of sesame (*Sesamum indicum*) are a bacterial leaf spot, a bacterial wet rot of the stem, and a bacterial brown spot of the fruit capsules, the causal organisms of which have not yet been identified; the troubles were most destructive in dense stands and in plots which were not surface-hoed during the growing period; of the 13 sesame varieties tested, Kruglik No. 1 alone appeared to be immune, and DSN showed 12·5 per cent. infection, all the remainder being highly susceptible (70·4 to 100 per cent. infection). A slight outbreak of a whitish, rounded or irregular leaf spot with a brown margin, up to 1 cm. in diameter, was observed for the first time in one locality; the causal organism is stated to be *Phyllosticta sesami* Bohovik, which has emergent, brown, mostly globose pycnidia, 30 to 100 μ in diameter, and hyaline, continuous, elongated pycnospores, rounded at both ends and 6 to 13 by 2 to 4 μ. The minor diseases of sesame include a wilt associated with a species of *Fusarium*, and a leaf spot caused by a species of *Macrosporium* morphologically corresponding to Sawada's description of *M. sesami* [ibid., xi, p. 350].

Considerable damage to groundnut (*Arachis hypogea*) and safflower (*Carthamus tinctorius*) was caused by grey rot of the inflorescences (*Botrytis cinerea*). In one locality an apparently hitherto unrecorded disease was observed on the groundnut, characterized by the presence, chiefly on the top leaves, of rounded or irregular, brown spots with a darker margin and a light centre, frequently coalescing; the affected leaves become chlorotic and die prematurely. The disease is caused by an unidentified species of *Alternaria*, and may eventually prove of economic importance, since its incidence in the affected fields varied from 58 to 93 per cent., with an average intensity of 2 of the 3 marks scale. A condition of the groundnut strongly reminiscent of 'rosette' [ibid., xv, p. 426] was occasionally found in two localities.

Drayton (F. L.). **The perfect stage of Botrytis convoluta.**—*Mycologia*, xxix, 3, pp. 305–318, 9 figs., 1937.

The writer records the development in culture of the apothecial stage of *Botrytis convoluta* [*R.A.M.*, xii, p. 292], the cause of the rhizome rot of *Iris*. The eight isolates used in the study were obtained from Germany,

France, Canada, and United States (5 strains), and were identical except for slight differences in readiness to sporulate and in the size of sclerotia produced. To obtain sclerotia that will later produce apothecia the author recommends the use of wheat grain (8 gm.) in distilled water (25 c.c.) per Petri dish [ibid., xiii, p. 461], and incubation at 14° C. in darkness for 45 days. The sclerotial groups are then removed and placed in preparation dishes on moist sand at 0° in darkness for 3 or 4 months; after that they are spermatized with microconidia and kept at 5° for about five weeks. Apothecial fundaments begin to appear during the period at 0° and their production is greatly accelerated at 5°. When they reach about 2 or 3 mm. in length the dishes are transferred to the greenhouse and placed under cheesecloth. The apothecia mature in about four weeks. If the cultures are subjected to light during the 45 day period at 14° the sclerotia produce conidiophores and conidia.

No distinctive receptive structures were recognized in this fungus and great difficulty was experienced in knowing when spermatization should be done. Some evidence was obtained that the protruding apothecial initials which emerge after the period of rest at 0° constitute the receptive structures.

The apothecial stage is named *Sclerotinia convoluta* sp. nov. with a diagnosis in English and Latin. The apothecia are infundibuliform to cyathiform becoming discoid, stipitate, 3 to 6·25 mm. high, with disks 2·5 to 4 mm. in diameter. The asci are cylindrical, 150 to 195 by 9 to 13 μ, with 8 uniseriate, ellipsoid, hyaline, continuous ascospores, 11·7 to 19·5 by 5·2 to 9·1 μ (mode 14·3 to 15·6 by 6·5 to 7·8 μ). Paraphyses are abundant, filiform, septate, hyaline, 2·5 to 3 μ in diameter, occasionally wider at the apex.

Mehlisch (K.). **Einige Blattfleckenkrankheiten.** [Some leaf spot diseases.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 25, p. 286, 1 fig., 1937.

Recommendations are made in these popular notes for the control of *Heterosporium echinulatum* [*Didymellina dianthi*: *R.A.M.*, xvi, p. 255] on carnation leaves by the use of healthy propagating material, supplemented if necessary by the repeated treatment of the cuttings with uspulun and the application to the older plants of 1 per cent. Bordeaux mixture.

H. syringae causes a relatively innocuous disease of lilac in the shape of a well-marked greyish-brown discoloration of the foliage in the autumn. Bordeaux mixture gives satisfactory control.

H. gracile [*D. macrospora*] is responsible for a widespread leaf blight of iris [ibid., xvi, p. 463], narcissi, and gladioli, the foliage shrivelling from the tip downwards. *Iris foetida* is particularly susceptible, *I. pumila* almost immune. Soft soap (2·5 kg. per 100 l.) should be added to the Bordeaux mixture to secure adhesion to the smooth leaves of these plants.

Rainio (A. J.). **Disease of Gladiolus caused by Bacillus variegatus Rainio n. sp.**—*Ann. bot. Vanamo*, vi (*1935–1936*), 8, pp. 3–7, 5 figs., 1936. [Received 1937.]

This is an abridged account of the gladiolus disease caused by

Bacillus variegatus n.sp. in Finland, a fuller version of which from another source has already been noticed [*R.A.M.*, xvi, p. 180].

Två svårartade sjukdomar hos odlade Liljor. Mosaiksjuka och Liliegråmögel. [Two destructive diseases of cultivated Lilies. Mosaic disease and grey mould.]—*Flygbl. Växtskyddsanst., Stockh.*, 32, 5 pp., 2 figs., 1937.

Popular notes are given on the only two diseases causing appreciable damage to cultivated lilies in Sweden, namely, mosaic [*R.A.M.*, xvi, p. 615] and grey mould (*Botrytis elliptica*) [ibid., xv, p. 507]. The former was first observed in 1932 on *Lilium candidum* and subsequently found to be widespread on *L. longiflorum*, while recent specimens submitted to the Experiment Station for examination include the imported *L. giganteum*, *L. formosum*, and other varieties. A few *L. longiflorum* plants from Bermuda have also been found to show rosette [ibid., xv, p. 444] symptoms. *B. elliptica* is particularly destructive on outdoor plants during hot summer weather, causing leaf, flower, and stem decay, infection being favoured by atmospheric humidity and abrupt changes of temperature.

Pirone (P. P.). **A new disease of Marigolds.**—*Flor. Exch.*, lxxxviii, 6, p. 52, 3 figs., 1937.

A new disease of marigold characterized by blackening and shrivelling of the stem near the soil-level followed by severe wilting, destroyed several outdoor plantings in the vicinity of New York in the summer of 1936, the symptoms becoming conspicuous after the plants had reached a height of a foot or more, death rapidly ensuing. The roots of diseased plants were almost completely decayed. The disease is attributed to *Phytophthora cryptogea* not hitherto reported as a disease of marigolds. Greenhouse tests showed that the variety Guinea Gold is most readily attacked, but all the African types [*Tagetes erecta*] are susceptible, while dwarf and French [*T. patula*] marigolds are resistant. The fungus was also found to be capable of causing seed decay and damping-off of seedlings in the greenhouse. For control, soil sterilization by steam is recommended, or failing that disinfection with formaldehyde. Diseased material should be removed and burnt.

Hassebrauk (K.). **Zur Frage der Verbreitung des Löwenmaulrostes durch das Saatgut.** [On the question of the spread of Snapdragon rust by means of the seed.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 23, pp. 261–262, 1937.

The possibility of seed transmission of snapdragon [*Antirrhinum majus*] rust (*Puccinia antirrhini*) [*R.A.M.*, xvi, p. 679] is refuted by the writer on the grounds of the short life of the uredospores, the inability of sporidia produced by the teleutospores to cause infection, and the lack of evidence of a perennating mycelium. Healthy plants have been raised from heavily infected seed, which may safely be used for propagation provided strict precautions are observed against the mechanical dissemination of the spores to existing plants.

KLAUS (H.). **Zur Bekämpfung des Chrysanthemum-Rostes.**—[On the control of Chrysanthemum rust.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 26, p. 294, 1937.

Spring and autumn applications of copper or sulphur fungicides, combined with the prompt removal and destruction of infected material, are urgently recommended for the control of chrysanthemum rust (*Puccinia chrysanthemi*) in the Berlin district [*R.A.M.*, xvi, p. 677], where the neglect of these precautions is stated to be causing heavy losses among the valuable Converse, Mona Davis, Brooks, Turner, and other varieties.

SCHMIDT (H.). **Das Asternsterben.** [The dying-off of Asters.]—*Kranke Pflanze*, xiv, 5, pp. 89–90, 2 figs., 1937.

A popular note is given on the dying-off of summer asters [*Callistephus chinensis*] in Germany caused by *Fusarium* spp. [*R.A.M.*, xiv, p. 172; cf. ibid., xvi, p. 256]. The diseased stems frequently rupture and masses of the white or pink *Fusarium* spores may be detected in the cracks, the proximity of some of which to the flowers may well lead to seed infection. Wilting is commonly not observed until shortly before or during flowering, but seedlings may also be affected; in mild cases no external symptoms may appear unless environmental conditions, e.g., rapidly rising temperatures, are conducive to outbreaks of the disease. Control of dying-off after its development being impracticable, strict attention should be paid to the prevention of the trouble by seed treatment with uspulun or ceresan (liquid or dust), steam sterilization of the propagating beds, change of planting sites, sparse nitrogenous manuring, and burning or deep burying of infected refuse.

MORWOOD (R. B.). **Paspalum ergot.**—*Qd agric. J.*, xlvii, 5, pp. 478–479, 1937.

Ergot of *Paspalum* [*dilatatum*: *Claviceps paspali*: *R.A.M.*, xv, p. 809], the widespread occurrence of which in Queensland is liable to cause sickness among stock, may be held in check by a system of intensive rotational grazing to prevent sclerotial formation on the seed heads. Mowing and a rapid firing of the cut grass will also assist in the temporary eradication of the disease, but in severe cases burning over may be necessary; if these measures fail the substitution of some other suitable grass for *P. dilatatum* should be considered.

WEIMER (J. L.). **The possibility of insect transmission of Alfalfa dwarf.**—*Phytopathology*, xxvii, 6, pp. 697–702, 1937.

Field observations in California having indicated the possibility of the transmission of lucerne dwarf [*R.A.M.*, xvi, p. 103] by insects, plants growing in proximity to infected ones were caged and found to remain free from the disease while uncaged plants contracted it. In preliminary experiments under controlled conditions, however, none of the insects tested communicated dwarf from diseased to healthy plants.

NOVIKOFF (V. A.). **Derangement of metabolism in the leaves of Lucerne when infected with the rust Uromyces striatus Schröt.**—*C. R. Acad. Sci. U.R.S.S.*, xv, 1, pp. 53–56, 1937.

The results of the biochemical studies discussed in this paper showed that infection of lucerne with rust (*Uromyces striatus*) [*R.A.M.*, xiii, p. 290] reduces the content of the host in carbohydrates, in total nitrogen, in protein and non-protein nitrogen (possibly by the conversion of combined nitrogen into gaseous nitrogen which escapes from the leaves), and in cellulose (to an amount almost equal to the increase in the hemicellulose content); the infected leaves were also found to contain an unknown sugar, which was usually absent from healthy leaves. These results are considered to indicate that the rust not only reduces the food value of lucerne, but also decreases its capacity of enriching the soil in nitrogen; it is therefore a serious source of loss and should be given greater attention than it usually receives.

BAUDYŠ (E.). **Rakovina Jetele a jiné choroby a škůdci Jetelin.** [Clover rot and other diseases and pests of Clovers.]—*Čes. odbor zem. rady morav. v Brně* [*Czech Sect. Moravian Bd Agric. Brno*], *Leaflet* 53, 4 pp., 6 figs. [Not dated. Received June, 1937.]

This is a semi-popular account of the diseases and pests of clovers and lucerne in Czecho-Slovakia, together with a discussion of the best measures for their control. Among the diseases of clovers mentioned clover rot (*Sclerotinia trifoliorum*) [*R.A.M.*, xv, p. 725] and anthracnose (*Kabatiella caulivora*) [ibid., xiv, p. 241] are the most important, the former also attacking lucerne, sainfoin [*Onobrychis sativa*], and certain other Papilionaceae, while other agents are *Mitrula sclerotiorum* [ibid., xv, p. 725], *Typhula trifolii* [ibid., xvi, p. 388], and, on the seed, *Macrosporium* [*Thyrospora*] *sarcinaeforme* [ibid., xvi, p. 616], *Botrytis cinerea*, and *Aplanobacter insidiosum* [ibid., xv, p. 586]; *Pseudomonas* [*Bacterium*] *medicaginis* [ibid., xv, p. 258] occurs on lucerne seed from America. Red clover [*Trifolium pratense*] is frequently attacked in the spring, after the disappearance of the snow cover, by *Fusarium trifolii* [ibid., xi, p. 624], which causes a black discoloration of the collar tissues and a premature withering of the foliage spreading in discrete, rounded patches in the field. *A. insidiosum*, *F. oxysporum* var. *medicaginis*, *Stagonospora meliloti* [ibid., xv, p. 632], and *Pseudopeziza medicaginis* [ibid., xiv, p. 424] occur on lucerne and *Phyllachora lathyri* on sainfoin. Since many of the diseases are seed-borne, it is recommended that clover seeds should be disinfected before sowing either by steeping for 8 to 10 minutes in 0·2 per cent. mercuric chloride or better still for one hour in 0·25 per cent. germisan [ibid., xv, p. 373].

CHANDLER (W. H.). **Zinc as a nutrient for plants.**—*Bot. Gaz.*, xcviii, 4, pp. 625–646, 5 figs., 1937.

This is a summary, supplemented by critical observations, of the problem of the zinc requirements of higher plants and fungi. Much of the work on which the review is based, including the studies conducted by the writer and his colleagues on little leaf or rosette of fruit trees in California, has already been noticed [*R.A.M.*, xvi, p. 682 and next

abstract]. The role of zinc is not known, but is thought to act as a catalytic agent in some essential reaction.

THOMAS (H. EARL). **Rosette or little leaf of fruit trees.**—*Phytopathology*, xxvii, 6, pp. 727–729, 1937.

In connexion with the discussion proceeding between Chandler and Hoagland on the one hand, and Kozlowski on the other, as to the etiology of rosette or little leaf of fruit trees in California [*R.A.M.*, xvi, p. 259], the writer briefly summarizes the available information on this problem from which it is inferred, in agreement with the first-named workers, that zinc deficiency is the primary cause of the condition.

FIKRY (A.). **Water-table effects. III. Further studies on relative incidence of diseases on stone-fruit trees.**—*Bull. Minist. Agric., Egypt*, 181, 12 pp., 4 graphs, 1937.

In further studies [*R.A.M.*, xv, p. 590] on the effect of varying heights of the sub-soil water table on the physiological gumming disease affecting plums, peaches, and apricots in Egypt, as well as shot hole [*Clasterosporium carpophilum*] and rust [*Puccinia pruni-spinosae*: ibid., xvi, p. 474] of these hosts carried out at Dokki near Cairo from 1932 to 1935, inclusive, the results obtained confirmed the previous findings. All three diseases severely affected trees in low-lying situations, but only lightly attacked those at higher elevations, where yield and growth were also much better than on the low ground.

In 1935, when the Nile floods were exceptionally high, a large proportion of the plum trees belonging to varieties susceptible to the gumming disorder were killed off in low-lying land at the Nile Delta Barrage, though resistant varieties remained healthy. Numerous peach trees on low-lying land in the Mit Ghamr district (Delta) were also killed by the disorder, though others at higher levels were unaffected.

VOLOSHINOVA (Mme B. A.). Результати обслідування розсадників України на зараженість їх гуглюватістю коріння (кореневий рак) плодових дерев. [The results of a survey of tree nurseries in the Ukraine to determine their infection with crown gall (root canker) of fruit trees.]—ex. *Збірник наукових праць по Захисту Рослин* [*Collection of scientific papers on Plant Protection*], pp. 124–134, 1 map, Держ. Видавн. Колгос. і Радгос. Літер. УССР. [Ukr. St. Publ. Off. Collect. Co-op. Fmg-Lit.], Kieff, 1936. [Received May, 1937.]

A brief tabulated account is given of investigations in 1931, the results of which showed that crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) is widespread in the Ukraine on all kinds of fruit trees [cf. *R.A.M.*, xii, p. 516], with a marked tendency of recent years to gain further ground. In the author's opinion the spread of the disease may be checked by certain cultural and quarantine measures, including prohibition of the growing of stock seedlings on the same soil for more than two years, and the adoption of a crop rotation period of at least six years. Since soil appears to be the main source of infection, nurseries showing over 15 per cent. infection among their stocks should be closed

down, and strict supervision should be maintained of other nurseries to ensure that no diseased seedlings are dispatched.

WORMALD (H.) & HARRIS (R. V.). **Notes on plant diseases in 1936.**—*Rep. E. Malling Res. Sta., 1936*, pp. 187–193, 1 pl., 1937.

This account of plant diseases investigated at East Malling in 1936 [*R.A.M.*, xv, p. 703] contains, among others, the following items of interest. *Nectria cinnabarina* [ibid., xv, p. 303] was associated with a canker of apple near Colchester. Some evidence was obtained that apple scions worked on East Malling rootstock XVI are more susceptible to *Podosphaera leucotricha* than apples on certain other rootstocks. *Verticillium dahliae* [ibid., xii, p. 488] was isolated from the main stems of quince stocks, Malling type C, on which pears were grafted; under 1 per cent. of the trees were killed by the infection. A wilt of the shoots in layer rows of plums, cherries, and peaches, which was first noticed in 1932 but became much more serious in 1935 and 1936, was associated with *Cylindrocladium scoparium* [ibid., x, p. 792]. Lesions a few inches long developed on the underground part of the shoot, which they subsequently girdled, causing the leaves to droop and wither. A comparison of the fungus with a culture of *C. scoparium* obtained from rose in America showed the two organisms to have different growth habits. Boskoop Giant black currants were almost defoliated as a result of infection by *Pseudopeziza ribis* [ibid., xv, p. 448]; the Baldwin variety was less affected, Seabrooks still more mildly, and Goliath was the most resistant of all.

In many districts heavy losses were caused among plums and cherries by bacteriosis (*Pseudomonas mors-prunorum*) [ibid., xvi, p. 691]; the disease was newly recorded from Northern Ireland, where it occurred on Victoria plums.

The bacterial leaf spot of Morello cherries reported in 1935 [ibid., xv, p. 703] was much less severe.

An organism which appeared to be related to *Pseudomonas prunicola* was isolated from Catillac pear spurs bearing withered flowers and from spotted Fertility pear fruits; inoculations of pear fruits with the organism obtained from the flowers and fruits gave lesions in both cases.

BAUDYŠ (E.). **Hniloba Jablek od jadřince.**—[Rotting of Apples from the core.]—*Čes. odbor zem. rady morav. v Brně* [*Czech Sect. Moravian Bd Agric. Brno*], *Leaflet* 57, 3 pp., 5 figs., 1937.

The author states that soils deficient in potassium induce the calyx end of apples grown on such soil usually to remain open, especially in varieties in which the calyx end is deeply sunk, and thus affords easy passage to the core for the spores of numerous fungi causing core rots in storage [*R.A.M.*, xvi, p. 688], such as *Fusarium avenaceum* (numerically the most important of the rotting organisms), *F. scirpi* var. *acuminatum*, *F. oxysporum* var. *aurantiacum* [ibid., xvi, p. 323], different species of *Cylindrocarpon* and of *Pestalozzia*, and others. A brief account is also given of apple rots caused in Czecho-Slovakia by other fungi [ibid., x, p. 253], namely, *Trichothecium roseum*, *Gloeosporium fructigenum* [*Glomerella cingulata*], *Gloeosporium album* [ibid., xv, p. 555], *Nectria galligena* [ibid., xvi, p. 324], *Penicillium crustaceum* [ibid., xii,

p. 377], *Aspergillus glaucus*, and *Botrytis cinerea*. A brief mention is made of a physiological brown spot of market apples, which was very frequently observed in 1936, especially in fruit imported from Rumania, the cause of which is ascribed to excessive fertilization of the soil with nitrogenous manure. This condition may be remedied by dressing the soil with potassium salts and superphosphate.

Some diseases of Apples.—*Mysore agric. Cal., 1937*, pp. 25, 33, 2 pl., 1937.

Diseases of apples have become so serious round Bangalore, India, as to threaten the cultivation of the crop. The most important is root rot due to *Sclerotium rolfsii* [*R.A.M.*, xvi, p. 262] causing the wilting and death of the tree. In addition to removing and destroying all affected plants, the roots of those remaining should be laid bare as far as possible and sprayed with 1 per cent. Bordeaux mixture. Spraying is stated to have given very good results over a number of years.

Stem rot characterized by cankers on the main stem and branches, often accompained with a dark brown exudate, is associated with *Schizophyllum* [*commune*: ibid., xvi, p. 106]. Infection probably takes place through broken twigs or through the stumps of the stocks remaining after budding. Affected trees ultimately die. Wounds should be protected by white lead paste or other dressing, and the stems whitewashed to prevent cracking from the sun.

Powdery mildew [? *Podosphaera leucotricha*] is common after the rains and first flush of growth; it can easily be controlled by spraying with 1 per cent. Bordeaux mixture with an adhesive.

Ruehle (G. D.). **Fungi which cause decay of Apples in cold storage.**—*Res. Stud. St. Coll. Wash.*, v, 2, pp. 99–100, 1937.

This is a condensed account of the writer's studies (1926 to 1929) on the fungi, especially *Penicillium expansum*, implicated in the decay of apples in cold storage in Washington, fuller versions of which have been noticed from other sources [*R.A.M.*, xi, p. 309; cf. ibid., xv, p. 733; xvi, p. 259].

Harding (P. L.), Lutz (J. M.), & Rose (D. H.). **Influence of packing and handling methods on condition of Apples barreled for export.**—*Tech. Bull. U.S. Dep. Agric.* 559, 25 pp., 7 figs., 1937.

Apples dispatched from the United States in barrels are stated frequently to reach European markets in an unsatisfactory condition, slackness of pack due to improper fitting, breakdown, and decay resulting from skin breaks being probably the most serious defects. Investigations were accordingly carried out from 1931 to 1934, inclusive, to devise methods of packing calculated to reduce this loss, using York Imperial apples in 1931, Rome Beauty in 1932, Jonathan in 1933, and Grimes Golden in 1934.

A summary of the results [which are discussed and tabulated] shows that shaking the barrels two or three times during filling, 'racking' (vigorously jolting the barrels backwards and forwards when nearly full) 15 times, with the 'plug' or 'follower' (a heavy canvas-covered wood or metal disk fitting easily inside the barrel to assist in settling

the fruit) in place, and filling to about ¾ in. above the top of the staves, sufficed to obviate appreciable settling of the apples. In the York Imperial tests it was observed that over-filling of the barrels tends to increase the amount of slackness by causing the skin breaks that pave the way for decay organisms. Slightly less bruising was induced by 'ring-tailing' than by 'jumble-tailing' the apples, and barrels headed with the machine press contained fewer badly bruised fruits than those on which a hand-operated screw press was used. The incidence of decay in the Rome Beauty barrels was not excessive, owing to the comparatively cool weather prevailing during the test. In Jonathans no slackness was found in barrels shaken when one-third and two-thirds full and racked 15 times when nearly full, and additional shaking and racking increased decay and skin breaks slightly. Barrels subjected to the extra rough handling liable to occur on board ship sustained heavy damage in the form of severe bruising, skin breaks, and decay. The relatively high percentage of bruising noted on Grimes Golden is attributed to the prominence of such defects on the pale colour of the fruit in contrast to the deeper tints of Rome Beauty and Jonathan. From about 12 to 14 per cent. of the skin breaks were found to be due to stem punctures, between which and the amount of shaking, racking, or height of pack, there was, however, no apparent correlation.

Wormald (H.). **The sooty blotch disease of Apples and Plums.**—*Rep. E. Malling Res. Sta., 1936*, pp. 194–197, 1 pl., 1937.

Sooty blotch (*Gloeodes pomigena*) [*R.A.M.*, xv, pp. 665, 666; xvi, p. 21] was very prevalent on apples in many parts of England in 1936, and caused serious infection of some plum varieties at East Malling, including Warwickshire Drooper (on which some 90 per cent. of the fruits were affected), Pershore Egg, Victoria, Pond's Seedling, Cambridge Gage, and Giant Prune. Satisfactory results were given in a small-scale test on control, using plums and apples, by the method recommended by Miss Bottomley [ibid., xiv, p. 452], i.e., a one-minute dip in 5 per cent. bleaching powder, followed by ten minutes' exposure to the air, washing, and drying. Small quantities of affected apples can be satisfactorily cleansed by rubbing with a damp cloth.

Ivanoff (S. S.) & Keitt (G. W.). **The occurrence of aerial bacterial strands on blossoms, fruits, and shoots blighted by Erwinia amylovora.**—*Phytopathology*, xxvii, 6, pp. 702–709, 2 figs., 1937.

This is an expanded account of the occurrence of aerial bacterial strands on pear pedicels, shoots, and fruits blighted by *Erwinia amylovora* in Wisconsin, a note on which has already appeared [*R.A.M.*, xvi, p. 473]. The strands are a fraction of a millimetre to several centimetres in length and 8 to 45μ wide. The bacteria of which they are composed remain viable for over seven days.

Engel (L.). **Vorzeitiger Blattfall bei Birnenwildlingen.** [Premature defoliation in free Pear stocks.]—*Blumen- u. PflBlau ver. Gartenwelt*, xli, 26, p. 300, 1937.

In German nurseries leaves of free quince and pear stocks infected by *Stigmatea mespili* [*Fabraea maculata*: *R.A.M.*, xv, p. 427; xvi,

p. 327] shrivel and fall prematurely, with the result that the plants fail to make proper growth and the cortex is not detachable for grafting purposes. Young shoots are also liable to attack. Repeated applications of 1 per cent. Bordeaux mixture and the burning of the diseased foliage in the autumn are recommended.

GONÇALVES (R. D.). **A entomosporiose ou mancha das folhas e fructas do Marmelleiro.** [Entomosporiosis or leaf and fruit spot of the Quince.]—*Biologico*, iii, 6, p. 183, 1937.

Fabraea maculata [see preceding abstract], in its imperfect stage (*Entomosporium maculatum*), is stated to be widespread in the State of São Paulo, Brazil, on the quince, and also on apple, pear, and other Pomaceae. On the first-named host it not only attacks the leaves, but also the fruit, causing cracking and deformation. Under local conditions periodical spraying of the trees, starting from the opening of the buds, with lime-sulphur (1 in 50) appears to give better control of the disease than spraying with Bordeaux mixture. The removal and burning of all infected material is recommended as an effective prophylactic measure.

WORMALD (H.) & PAINTER (A. C.). **Further observations on brown rot of Plums in cold storage.**—*Rep. E. Malling Res. Sta., 1936*, pp. 198–200, 1 pl., 1937.

When Victoria and Giant Prune plums and Bradley's King damsons were kept in cold storage at about 35° to 37° F. for periods ranging from 12 to 34 days (some lots being accidentally exposed to between 38° and 42° for part of the time) wastage in the plums was due to the same fungi as in 1934 [*R.A.M.*, xiv, p. 641], *Sclerotinia fructigena* predominating, and *S. laxa* being present on a few of the fruits, alone or accompanied by the former, while some of the plums showed the presence of *Botrytis cinerea*, a species of *Mucor*, and a *Penicillium*. *S. fructigena* and *S. laxa* were approximately equally active on damsons in storage.

HIGGINS (B. B.) & WOLF (F. A.). **Frosty mildew of Peach.**—*Phytopathology*, xxvii, 6, pp. 690–696, 1 fig., 1937.

Studies were made in North Carolina and Georgia on the morphology and life-cycle of *Cercosporella persicae* Sacc. (syn. *Cercospora persica* Sacc., *Clasterosporium persicum* (Sacc.) Tsugi) the agent of frosty mildew of peaches [*R.A.M.*, vii, p. 176], a widespread pathogen in neglected orchards throughout the United States, Europe, and the East. The disease first appears in June in the form of white, later yellowish powdery patches of irregular extent on the leaves, which are prematurely shed. In addition to the conidial stage, the fungus was observed to produce spermogonia and perithecia, necessitating its transference to *Mycosphaerella* as a new species, *M. persica*, a Latin diagnosis of which is furnished.

The hyaline, vermicular to clavate, pluriseptate conidia, 17 to 86 by 2·5 to 7μ, are abstricted from the apex of short, knob-like conidio-

phores branching laterally from the mycelium. The black, erumpent, densely aggregated, globose perithecia measure 75 to 110 by 60 to 106μ in diameter and are provided with a papilliform or obtusely conical ostiole and a thin, dark brown, membranaceous wall. The cylindrical to clavate, shortly stipitate, fasciculate, aparaphysate asci measure 36 to 55 by 7 to 10μ and contain eight distichous, straight or curved, unequally septate, hyaline ascospores, 12 to 20 by 2·5 to 3·5μ. The ovate or globose, black spermogonia, 48 to 72 by 52 to 91μ, formed in profusion in the autumn in the fallen leaf tissues, are occupied by bacilliform, hyaline spermatia, 2·5 to 4 by 0·5μ. Spermatial production ceases after about two months, and the perithecia do not mature until the following spring.

The genetic connexion between the familiar imperfect stage and the ascigerous phase of *M. persica* was demonstrated by cultures and by inoculation experiments on Elberta and Belle of Georgia peach trees. Conidia were produced in abundance in three- to four-day-old cultures arising either from conidia or ascospores. Three weeks after inoculation with conidial suspensions either from diseased leaves collected in the orchard or from conidial or ascospore cultures, the foliage developed the typical whitish lesions of the *Cercosporella* stage. In another test, using an aqueous conidial suspension from a single ascospore culture, heavy infection developed after about five weeks on 37 out of 50 leaves, which also produced spermogonia and perithecia in the following autumn. No infection occurred on the uninoculated control leaves. At the same time, fragments of overwintered peach leaves bearing mature perithecia were bound to the lower surface of 32 field-grown peach seedlings not infected during the previous year, of which 20 contracted typical frosty mildew.

Hildebrand (A. A.). **Strawberry root-rot in Ontario.**—Reprinted from *Canad. Hort. & Home Mag., 1937*, 7 pp., 1937.

Recent surveys in Ontario have revealed outstanding cases in which strawberry root rot or black root [*R.A.M.*, xv, p. 449; xvi, p. 623] originally appeared in and spread from low-lying parts of a plantation. Both soil moisture and soil temperature have an important bearing on the disease, as well as soil organisms, and in certain recent experiments at St. Catharines it was shown that when strawberry plants were grown at 44° to 48° F. in root-rot soil adjusted to contain 60 per cent. of its maximum water content, the root systems remained healthy, though when the soil temperature and moisture were increased the disease appeared and gradually became more severe with increasing temperature and moisture, until plants set in the soil at 60° and 80 per cent. moisture died within a week. Even at the most favourable temperatures plants in wet soil were very adversely affected.

Growers are advised to purchase good quality stock. The plants should be rinsed in water and examined carefully before being set out, all weaklings and plants with roots showing a brownish discoloration being discarded. The soil must be well-drained, and attention should be paid to the nutritional requirements of the plants. It is believed that crop rotation and the ploughing under of green manure may offer an effective means of control.

HARRIS (R. V.) & HILDEBRAND (A. A.). **An investigation of Strawberry virus disease in Ontario.**—*Canad. J. Res.*, xv, 6, pp. 252–280, 4 pl., 4 diags., 1937.

In 1933, symptoms of a strawberry disease analogous to those of yellow edge in England [*R.A.M.*, xv, pp. 732, 817] were observed in Ontario on the Parson's Beauty variety both in the field and in the greenhouse, and on one plant of the Forward variety in the greenhouse, but only for a limited period early in the growing season, and in no case so clearly pronounced, especially as regards the marginal chlorosis, as in England. In experiments, started the same year, at St. Catharines, Ontario [a detailed account of which is given], 'normal' Royal Sovereign plants, obtained from a clone which had been minutely rogued for yellow edge in England, were used as indicators for the presence of yellow edge in the Canadian varieties. Transmission trials (by runner grafting) resulted in the development in the Royal Sovereign plants of symptoms, macroscopically indistinguishable from typical yellow edge, from the local varieties Glen Mary, Parson's Beauty, and Premier, which were also shown to possess to a marked degree the capacity of being symptomless carriers of the virus. No diagnostic symptoms whatever were observed on the Premier variety, some plants of which, however, do not carry the virus at all. Supplementary experiments in 1935–6 at East Malling Station (a full report of which is reserved for future publication) showed that of the two parent *Fragaria* species common to commercial varieties in North America and England, *F. chiloense* is highly tolerant to yellow edge virus, all the test plants being found infected without manifesting any outward symptoms, while *F. virginiana* is highly susceptible and exhibits the symptoms with extreme readiness and persistency. Some explanation of the wide range of varietal reaction to disease of the yellow edge type is thus provided. The results of the experiments also showed that a large proportion of the plants of the 'normal' Royal Sovereign clone used as indicators in the experiments was infected with a distinct virus of the crinkle type [ibid., xiii, p. 642; xiv, p. 288], which may explain the fact that in certain graft series in St. Catharines the Premier components showed deterioration suggesting reciprocal infection between it and the Royal Sovereign component.

HARRIS (R. V.). **Virus diseases in relation to Strawberry cultivation in Great Britain—a synopsis of recent experiments at East Malling.**—*Rep. E. Malling Res. Sta., 1936*, pp. 201–211, 1 pl., 1 diag., 1937.

In this account of investigations carried out since 1927 at East Malling, Kent, into virus diseases of strawberries, with special reference to their effect on varietal deterioration, the author states that the results of tests on the indicator plant *Fragaria vesca* demonstrated that crinkle [see preceding abstract] is widely distributed in England, mainly in a very mild form, throughout the available stock of healthy (yellow edge free) Royal Sovereign plants, and is constantly associated with yellow edge [loc. cit.] in the sense that all yellow-edge plants examined also showed minute traces of mild crinkle. In 1935 and 1936 the incidence of severe crinkle, similar to that observed in the south-west of England, was found to be increasing, though not frequent, and experiments showed that

this form is indicated by the additional infection of mildly crinkled plants by a further virus. The most salient distinction between the symptoms of crinkle and yellow edge is that in crinkle the chlorosis is localized in minute, unevenly distributed circular areas or spots, whereas in yellow edge it is continuous round the leaf margin. *Capitophorus fragaefolii*, the vector of yellow edge [*R.A.M.*, xv, p. 732], is a vector of crinkle in America [ibid., xiii, p. 110], as well as of xanthosis, the American analogue of yellow edge [ibid., vii, p. 650], and experiments are planned to determine whether crinkle is also transmitted in England by this insect.

HARRIS (R. V.). **Studies in Strawberry virus diseases. III. Transmission experiments with 'crinkle', 1935.**—*Rep. E. Malling Res. Sta., 1936*, pp. 212–221, 3 pl., 1 diag., 1937.

When strawberry seedling varieties (crosses between English, and English and American commercial varieties) obtained from Cambridge were grown at East Malling in 1934 symptoms appeared closely resembling those of North American crinkle and the analogous disease observed at Long Ashton [see preceding abstracts], though no plants at East Malling had been previously observed to be similarly affected. Fifteen out of 49 families showed yellow edge [loc. cit.] and seven showed distortion or crinkling with small circular to irregular lesions with or without necrotic centres. In five of the families so affected the chlorotic leaf margins and leaf curl characteristic of yellow edge were also very faintly present, while in the remaining two families crinkle alone was observed. An attempt was then made to transmit this form of crinkle by runner grafting from selected plants of the affected seedlings to 'normal' Royal Sovereign plants, a further experiment being made in collaboration with the Long Ashton Station, in which batches of normal Royal Sovereign plants of clonal origin were infected at each centre simultaneously. Both experiments gave positive results, symptoms of severe crinkle developing on the normal indicator plants that closely resembled North American crinkle and the severe type reported from Long Ashton. In addition to the crinkle the indicator plants subsequently developed symptoms of yellow edge. These results appear to confirm the virus origin of crinkle symptoms in England. Furthermore, the following data indicate that crinkle is causally distinct from yellow edge; namely, (1) crinkle symptoms were not transmitted to the exactly comparable yellow edge-infected Royal Sovereign plants used in the initial experiment of 1932 [*R.A.M.*, xii, p. 519]; (2) they did not appear at East Malling in previous years on yellow-edge or normal Royal Sovereign plants, or in combination with yellow edge or otherwise on comparable Royal Sovereign plants at Cambridge; and (3) comparable crinkle symptoms did not appear either alone or in combination with induced yellow edge on Royal Sovereign indicators in parallel experiments made the same year with English commercial varieties.

MOORE (M. H.). **Notes on the control of Strawberry mildew (Sphaerotheca humuli).**—*Rep. E. Malling Res. Sta., 1936*, pp. 276–279, 1937.

Satisfactory control of mildew (*Sphaerotheca humuli*) [*R.A.M.*, xiv,

p. 376; xvi, p. 692] on strawberry plants on which the disease was already well established was obtained at East Malling in 1935 by one application of lime-sulphur (1 or 2 per cent.) or dusting with flowers of sulphur. The effect of the spraying was more lasting than that of the dusting. None of the treatments caused any serious injury. In 1936, two treatments with 2 per cent. lime-sulphur and flowers of sulphur gave the same results as in 1935. Dusting should be effected once every week or ten days and spraying once every two or three weeks during the period when there is a danger of infection.

Simmonds (J. H.) & Mitchell (R. S.). **The squirter disease in Bananas with special reference to its control.**—*Qd agric. J.*, xlvii, 6, pp. 542–548, 1937.

Following a concise review of the results of earlier work on the squirter disease of bananas [*Nigrospora sphaerica* or *N. musae*: *R.A.M.*, xv, p. 104] details are given of further investigations of the control of the disease. In trials of various fungicides for the disinfection of fruit before packing shirlan A.G., used at strengths of 1 and 3 per cent., reduced the percentage of severe black end due to *Nigrospora* from 48·6 to 0·3 and from 61·9 to 8·2, respectively, less satisfactory results being obtained for black end due to *Gloeosporium musarum*. In further experiments fruit from the plantation was brought to the packing shed, cut into part hands or singles, immersed in different brands of shirlan just sufficiently long to ensure thorough wetting, then drained and packed. The fruit was ripened as slowly as possible in rooms kept at the lowest temperature available at the time. The results showed complete control of squirter in singles for all strengths of shirlan used. Fruit dipped in 1 and 3 per cent. shirlan A.G. as one-third hands and then broken into singles showed 0·6 and 1·6 per cent. infection, respectively, compared with 21·7 and 30·2 per cent. in the controls. Fruit treated in part hands and packed as such would give approximately as good control as dipping in singles. The use of 1 per cent. shirlan A.G. is recommended as routine practice during the winter and early summer on all plantations where losses from squirter are likely to occur.

Carter (W.). **Aphis transmittal of Commelina nudiflora Linnaeus mosaic to Pineapple.**—*Ann. ent. Soc. Amer.*, xxx, 1, pp. 155–158, 2 pl., 1937. [Abs. in *Rev. appl. Ent.*, xxv, A, 8, p. 516, 1937.]

Experiments in Hawaii showed that *Commelina nudiflora* mosaic is transmissible to pineapple by *Aphis gossypii*, *Myzus persicae*, and *Macrosiphum solanifolii*, inducing symptoms closely resembling those of yellow spot [*R.A.M.*, xv, p. 673]. Under field conditions the insects are probably unable to penetrate the relatively hard tissues of the pineapple, which may, therefore, usually escape infection notwithstanding a naturally high degree of susceptibility to the virus.

Branas (J.) & Bernon (G.). **Recherches sur les poudres cupriques. (Premier mémoire.)** [Investigations on cupric dusts. (First memoir.)]—*Rev. Vitic., Paris*, lxxxvi, 2238, pp. 367–374, 1 graph, 1937.

In studies on the laboratory evaluation of the efficiency of cupric

dusts against vine mildew (*Plasmopara viticola*) the authors point out that the toxicity of the dusts to fungi stands in direct relation to the solubility of the copper compound embodied in them in atmospheric water. From this consideration, they introduce the concepts of initial and reactional 'anticryptogamicity', the first of which is defined as the ratio of the quantity of copper compound dissolved, in the absence of a solubilizing agent, in water at $P_H 7$ to the total initial amount of the compound in the dust tested, and the second as the additional proportion of the compound dissolved as the P_H value of the water is lowered. In their experiments they tested the solubility of copper sulphate, copper oxychloride, copper hydrocarbonate, and copper hydrate in water at P_H values of 7, 5·7, 5·5, 4, and 3·4, and showed that between the values of 4 and 7 the descending solubility curve assumes the form of a straight line, and that reactional anticryptogamicity may be based on the angle formed by this line with the ordinate. The results indicated that the initial anticryptogamicity of the compounds varied from 72 per cent. for copper sulphate, to 2·7 per cent. for copper hydrocarbonate, 0·33 per cent. for copper hydrate, and nil for the oxychloride, the reactional anticryptogamicity varying from 4·6, to 0·23, 0·21, and 0·19 per cent. respectively. The results of further tests showed that the nature of the inert component (carrier) of the dust very considerably affects the solubility of the copper compound, since talc containing 5 per cent. calcium hydrate reduced it from 72 per cent. for copper sulphate to 0, kaolin raised it to 90 per cent., and powdered ox bile to 100 per cent. Dusts showing unsatisfactory initial and reactional anticryptogamicity are inefficient in practice but dusts satisfactory in this respect may have to be rejected on other grounds. The results indicated that fungicidal dusts should not contain copper salts of a low solubility in water with P_H values close to those of meteoric water, and that alkaline carriers should also be avoided, since they reduce the solubility of the copper salts.

Nikitin (A. A.). **Zeolitic copper compounds as fungicides.**—Thesis, Columbia Univ., 72 pp., 16 graphs, 1937.

The laboratory and commercial preparation of copper zeolite [*R.A.M.*, xv, p. 665; xvi, p. 544], a new colloidal fungicide, from sodium silicate, sodium phosphate, sodium aluminate, and copper sulphate, is described in detail. Toxicity studies on the product, based on the laboratory method of McCallan [ibid., ix, p. 730], showed that the high copper content (25 per cent.) and low content of insoluble sulphate both improve toxicity, whilst the extremely low basic copper sulphate content reduces crop injury. Extensive fields tests against apple scab (*Venturia inaequalis*), fruit spot (*Phoma pomi*), black rot (*Physalospora cydoniae*) [*P. obtusa*], and insects have demonstrated the superior value of the fungicide both when used alone and with insecticides. Copper zeolite does not generally require a spreader, but the addition of copper soap (1 per cent. by weight of the dry fungicide) increased wetting power and adhesiveness.

Moore (M. H.), Montgomery (H. B. S.), & Shaw (H.). **Field trials in 1936 of the fungicidal and phytocidal properties of certain new**

chemical preparations. A progress report. I. Fungicidal properties. II. Preliminary phytocide tests.—*Rep. E. Malling Res. Sta., 1936*, pp. 259–266, 1 pl., 1937.

In a spraying test carried out at East Malling in 1936 nine-year-old Worcester Pearmain, Edward VII, Allington Pippin, and Newton Wonder apple trees on No. IX rootstock given two pre- and two post-blossom applications of 1 per cent. lime-sulphur, 0·5 per cent. microsul, sulsol, R.D. 4367, bouisol, or Bordeaux mixture (3–9–100) showed, respectively (aggregating the results for all varieties), 1·4, 13·8, 3·2, 3·8, 1·3, and 2·3 per cent. scab (*Venturia inaequalis*), as against 0·1 per cent. for buffer trees given lime-sulphur at 2·5 and 1 per cent. concentrations for the pre- and post-blossom applications, respectively, and 32·5 per cent. for the unsprayed controls. Lime-sulphur used at a concentration of 1 per cent. for the post-blossom applications caused fruit drop. Both of the copper sprays caused leaf burn and russeting, more particularly bouisol, which also caused severe fruit drop. The Worcester Pearmain and Edward VII controls remained, respectively, lightly infected and uninfected.

In phytocide tests of 15 substances intended for use as fungicides all the copper-containing preparations applied to Cox's Orange Pippin caused severe damage at all concentrations down to 0·1 per cent. of copper, and in one instance down to 0·025 per cent.; the following were all safe at concentrations up to 1 per cent., viz., 25 per cent. tetramethylthiuram disulphide dispersion, 20 per cent. ammonia-shirlan, copper-8-hydroxyquinoline (20 per cent. base), and 10 per cent. brilliant green on bentonite.

Moore (M. H.) & Montgomery (H. B. S.). **A field spraying trial of combined fungicide-insecticide sprays in 1936. A progress report.**—*Rep. E. Malling Res. Sta., 1936*, pp. 267–275, 1 fig., 1937.

In further spraying tests at East Malling with combined fungicide-insecticide sprays [*R.A.M.*, xv, p. 728] the addition of a spreader to lime-sulphur did not affect the control of scab (*Venturia inaequalis*) on Cox's Orange Pippin and Worcester Pearmain apple trees. In an attempt to reduce the concentration of the lime-sulphur used, it was found that for pre- and post-blossom applications the 1 per cent. strength was as effective in reducing scab on mature fruits as at 2·5 per cent. pre-blossom followed by 1 per cent. post-blossom, but on certain other varieties in another trial [see preceding abstract] the stronger pre-blossom spray was more effective than the weaker. General observation of the foliage indicated that the 1 per cent. spray was inferior. Weak Bordeaux mixture (2-10-100) caused severe leaf burn, defoliation, and russeting, but gave efficient scab control on the fruits.

The addition of nicotine to the petal-fall spray controlled sawfly [*Hoplocampa testudinea*] satisfactorily without a spreader.

Stevens (N. E.) & Wood (Jessie I.). **Recent fluctuations in plant diseases in the United States.**—*Bot. Rev.*, iii, 6, pp. 277–306, 10 graphs, 8 maps, 1937.

The writers discuss, in relation to geographical, environmental, and economic factors, some striking recent instances of fluctuations in the

incidence and severity of some well-known plant diseases in the United States [cf. *R.A.M.*, xvi, p. 479]. Most of the papers cited to illustrate the observations have been noticed in this *Review*.

BRAUN (H.). **Pflanzenhygiene. Richtlinien und praktische Massnahmen zur Gesunderhaltung der Pflanzen.** [Plant hygiene. Indications and practical measures for the maintenance of plant health.]—98 pp., Berlin, P. Parey, 1937. RM. 4 (RM. 3 abroad).

The underlying principle of this practical treatise on plant hygiene is the superiority of prevention to cure, and with this end in view the means of maintaining agricultural crops in a sound condition are discussed under the general headings of cultural, antiseptic, and quarantine measures, the first comprising observations on ecological factors, the improvement of adverse environmental conditions by appropriate cultural practices, and the application of the rules of hygiene to such measures as crop rotation, choice of varieties, seed selection, time and depth of sowing, and planting distance.

MANIL (P.). **Quelques données nouvelles sur les virus des plantes.** [New data on plant viruses.]—*Bull. Soc. Bot. Belg.*, lxix, 2, pp. 149–153, 1937.

In this paper the author briefly discusses some recent advances in the study of plant viruses [*R.A.M.*, xvi, p. 628], the points touched upon including the nature of ultraviruses, virus strains, insect transmission, particle size, plant immunity and resistance, virus complexes, purification, and autocatalysis.

BOYLE (L. W.) & MCKINNEY (H. H.). **Trichomes of incidental importance as centers for local virus infections.**—*Science*, N.S., lxxxv, 2210, pp. 458–459, 1937.

In experiments to determine the relative importance of trichomes and other epidermal cells as points of virus entry, inoculations [?with tobacco mosaic] were made by cutting off or mutilating the trichomes with a fine instrument while immersed in a drop of virus extract under a dissecting microscope. Inoculation of 2,290 cut trichomes of *Nicotiana sylvestris* gave 2·2 per cent. positive results, and on *N. sylvestris*, *N. glutinosa*, and *N. rustica* leaves on which all the trichomes had been mutilated, 35, 22, and 12 per cent. positive results, respectively, were obtained. Trichomes are sparse on pepper (*Capsicum frutescens*) leaves, so it was possible to inoculate, by light rubbing, areas of epidermis without bruising the trichomes. Approximately the expected number of local lesions resulted, showing that ordinary epidermal cells are very susceptible.

When about 95 per cent. of the trichomes on *N. sylvestris* half-leaves were destroyed by wiping, and the whole leaves inoculated by wiping after an interval of two to six days, 6·8 per cent. less lesions resulted on the halves wiped twice than on the others; but when the first wiping was done with carborundum and water, thus destroying about 98 per cent. of the trichomes and injuring or killing many ordinary epidermal cells, the corresponding reduction was 31 per cent.: these results indicate that trichomes are not of major importance, while ordinary epi-

dermal cells are of considerable importance. Pepper and *N. sylvestris* leaves have approximately 16 and 346 trichomes per sq. cm., respectively. Wiped inoculations on the former produced 82·4 per cent. lesions not related to trichomes, whereas on the latter 39·87 per cent. had no relation to trichomes, 39·87 per cent. had broken trichomes in their centres, and 20·26 per cent. had trichomes on their margins and had probably originated from ordinary epidermal cells. It is concluded that the larger percentage of trichome infections in *N. sylvestris* is due to the greater number of trichomes, that many ordinary epidermal cells serve as virus entries, and that the importance of trichomes in this respect has been over-estimated.

CHESTER (K. S.). **A simple and rapid method for identifying plant viruses in the field.**—*Phytopathology*, xxvii, 6, pp. 722–727, 1 fig., 1937.

In an endeavour to adapt the exacting technique of precipitin testing [*R.A.M.*, xvi, p. 698] to field work, the writer found the use of crude, untreated, expressed plant juices to be entirely practicable in tests for the presence of six different viruses. The procedure is as follows. A ¼ to ½ of a mature tobacco leaf is wadded into a ball and wrapped in cheesecloth, pressed, and worked with the fingers until well crushed. Enough juice is squeezed out to reach the 2 c.c. level of a 5 c.c. Wassermann tube, which is then filled nearly to the top with serum dilution (1 : 9 or higher), shaken and set in the ground near the test plant. After a brief interval the reaction is observed, a positive response being denoted by the presence of a flaky-green precipitate, best viewed by transmitted light, which rapidly settles to form a dense green deposit, about 1 cm. in depth. The strongest reactions appear after two to five minutes, and in no case was a specific response apparent after one hour. The tubes should be read after 15 to 20 minutes and again after an hour.

The sera are prepared by the methods previously described [ibid., xiv, p. 781]. Each serum is absorbed with two parts of the juice of healthy specimens of the diseased species used in animal inoculations, and then further diluted to a concentration giving an optimum reaction in laboratory titration. Two c.c. of virus-containing juice proved satisfactory for titration with five of the viruses tested, viz., latent potato mosaic, potato veinbanding [ibid., xvi, p. 703], tobacco ring spot, etch [ibid., xvi, p. 568], and potato aucuba mosaic [ibid., xvi, pp. 337, 569, *et passim*], but in the case of tobacco mosaic, five or six drops per tube gave the best results. The reaction is specific for each virus, regardless of the host, and healthy plant juice reacts with none of the sera. Masking of symptoms does not interfere with the reaction, and in the case of virus mixtures each component may be identified by its proper serum.

The technique herein described, though primarily designed for field work, has also been found valuable in the laboratory, and it seems possible, from the results of preliminary trials, that the list of viruses susceptible to serological methods may be considerably extended through the use of crude juices as test antigens. For instance, two etch strains, severe etch and Blakeslee's Z-mosaic of *Datura*, which fail to react as test antigens in the ordinary precipitation techniques, respond positively with etch serum by the more sensitive field method.

Guinier (P.). **Sur la formation des 'ronds de sorcière' et le fonctionnement physiologique des mycorhizes ectotrophes.** [Note on the formation of 'fairy rings' and the physiological action of ectotrophic mycorrhiza.]—*Ann. Sci. nat., Bot.*, Sér. X, xix, pp. 291–298, 1937.

The author states that in all the cases studied by him in France chemical analysis showed that the ammonia content of soil was markedly higher within the dark green areas marking the 'fairy rings', caused by the development of various Basidiomycetes in meadows and lawn turf, than in the soil immediately inside or outside the rings; the same was also true of the soil taken in coniferous forests from immediately beneath the sporophores of *Craterellus clavatus*, *Clitocybe inversa*, and *C. nebularis*, which form ectotrophic mycorrhiza with the roots of the trees. These findings are interpreted to indicate that the beneficial effect of such mycorrhiza on the trees [*R.A.M.*, xv, p. 673] is due to the accumulation by the fungi of ammonia in the soil.

Magrou (J.). **Sur la culture des champignons de mycorhizes.** [Note on the culturing of mycorrhizal fungi.]—*Ann. Sci. nat., Bot.*, Sér. X, xix, pp. 359–370, 9 figs., 1937.

This is an expanded account of the technique by which the author induced the mycorrhizal endophyte of *Arum maculatum* to grow into drops of soil decoction in Van Tieghem cells, a preliminary paper on which has already been noticed [*R.A.M.*, xv, p. 243; cf. also ibid., xvi, p. 267].

Klečka (A.) & Vukolov (V.). **Srovnávaci studie o mykorrhize lučních halofytů.** [Comparative studies of the mycorrhiza of meadow halophytes.]—*Ann. Acad. tchécosl. Agric.*, xii, 2, pp. 190–195, 2 pl., 1937. [German summary.]

The roots of *Suaeda maritima*, *Salicornia herbacea*, *Plantago maritima* and six other species of plants collected from salt marshes in Czecho-Slovakia showed the presence of mycorrhiza, which in their morphological and anatomical details were identical with the endotrophic mycorrhiza found by the authors in woody plants, e.g., *Sambucus nigra*. In both kinds of hosts the fungal elements of the mycorrhiza form in the host cells much convoluted agglomerations of hyphae which undergo a process of digestion, and also ovate, thick-walled 'spores'. The presence of the mycorrhiza in the roots of the halophytes examined, especially in the younger rootlets, appears to be frequent, and is interesting in that these formations are able to withstand the high osmotic pressure in the host cells.

Blattný (C.). **Přispěvek k poznáni intraspecifické averse u plísni.** [Contribution to the study of aversion in mould fungi.]—*Ann. Acad. tchécosl. Agric.*, xii, 2, pp. 138–141, 4 figs., 1937. [German summary.]

Typical aversion phenomena [*R.A.M.*, xvi, p. 245] were observed by the author between monospore cultures of different strains of *Penicillium corymbiferum* [ibid., xiii, p. 380] and *P. glaucum*. Monospore cultures of one and the same strain at first exhibited a slight aversion

from one another, which, however, disappeared later. When strips of the substratum, free from mycelium and spores, were transferred from between the averting colonies to fresh agar and were inoculated with one of the strains exhibiting aversion, the latter produced mycelium, but its fructification was delayed by seven days, indicating the presence in the substratum of a substance inhibiting the growth of the organism, the nature of which is not known. A similar retardation in the fructification of the fungi was also exerted by the 'juices' exuded into the substratum before pupation by the caterpillars of the silkworm *Bombyx mori*. Finally, aversion phenomena were noticed between monopycnidial strains of *Phoma betae*. The author believes that aversion is much more common among fungi than is known at present, especially during the initial stages of growth in culture.

Verner (A. R.) & Altergot (V. F.). **On the phenomenon of mycophagy.**—*C.R. Acad. Sci. U.R.S.S.*, xv, 4, pp. 219–224, 2 figs., 1937.

The authors state that when grown on Waksman's agar medium or on must agar pure cultures of *Fusarium niveum* frequently underwent a strong lytic process (termed by them automycophagy), resulting in a more or less rapid and complete dissolution of the mycelium. The chlamydospores appeared to be comparatively resistant to the process, inasmuch as they were often found intact in what seemed an entirely disorganized fungus mass. Viable macro- and microconidia were only found in slightly decomposed cultures. The lytic principle was isolated by filtration from the deformed fungus mass of a three-month-old lysing culture of *F. niveum*; besides exerting a lytic action on this organism, it also lysed cultures of *F. lini*, and was found to withstand passage through a Seitz filter No. 3 and repeated boiling for 15 to 20 minutes.

Eckstein (O.), Bruno (A.), & Turrentine (J. W.). **Kennzeichen des Kalimangels, signes de manque de potasse, potash deficiency symptoms.**—235 pp., Berlin, S.W. 11, Verlagsgesellsch. für Ackerbau m.b.H., 1937. [Abs. in *Ernähr. Pfl.*, xxxiii, 17, pp. 267–268, 1 col. pl., 1937.]

This is a trilingual (German, French, and English) scientific and practical treatise on potash deficiency symptoms in 56 cultivated plants of all zones. The first part of the work deals in general terms with the external symptoms of potash deficiency on the foliar, root, floral, and fruiting systems, and growth habit, modifications in the internal structure, secondary effects, such as lessened resistance to disease and other adverse factors, reduction in the market value of the products, and pathological disturbances of functional, metabolic, and physiological processes. In the second portion the effects of potash shortage are discussed in relation to certain particularly important crops, namely, maize and other cereals, fruit trees, and vines. The volume is furnished with fine black and white and coloured illustrations.

Sanford (G. B.). **Studies on Rhizoctonia solani Kühn. II. Effect on yield and disease of planting Potato sets infected with sclerotia.**—*Sci. Agric.*, xvii, 10, pp. 601–611, 1937. [French summary.]

In experiments extending from 1933 to 1935 the effect of planting

potato setts heavily infected with viable sclerotia of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvi, p. 338] was to reduce the yield of large-size tubers from an average of 42·7 kg. per 100 setts for apparently clean tubers, treated with mercuric chloride, to 40 kg., the total yields from healthy and diseased setts being 55·6 and 59·0 kg., respectively, and the yield of small-size tubers 12·9 and 18·7 kg., respectively. Corresponding figures for 1936 per 10 setts were 296·1 and 317·7, 305·9 and 331·8, and 9·4 and 13·7 oz. respectively. Neither yield of large- or small-size tubers nor total yield were dependable criteria regarding the value of tuber treatments for the control of the disease, the first two giving results in about 40 per cent. of the experiments and the latter in 20 per cent. Out of 3,400 plants from heavily infected setts approximately 58 per cent. had no lesions on the stem. Neither deformed tubers nor sclerotia on the tubers at harvest were reliable indications of any beneficial effect of tuber treatment. From other experiments not reported in this paper a very definite increase of yield both in large-size tubers and total crop was obtained by amputating the first stolons, and although percentage stem infection constitutes a fairly reliable index of both soil infestation and control during early growth, it is necessary to determine the effect on the stolons for control to be interpreted in terms of yield. In conclusion it is suggested that the effect of treatment on the sclerotia may be determined in the laboratory and that on the tuber in the greenhouse in preference to ordinary field tests.

Bryan (H.). **The importance of healthy seed in Potato culture.**—*J. nat. Inst. agric. Bot.*, iv, 2, pp. 179–182, 1937.

Approximately 380,000 acres out of a total 500,000 acres of potatoes grown annually in England and Wales are planted with English-grown seed of unknown health, and the loss by the use of such seed must be enormous. In experiments initiated at Ormskirk in 1929 to ascertain if the health of imported stocks could be maintained without recourse to fresh seed, healthy potatoes of the virus-susceptible Arran Consul variety were grown isolated from other potatoes by a distance not less than 60 yds. Suspects were promptly rogued out, but not more than 2 per cent. of the plants were removed in any year. Comparative trials in the sixth year of the Arran Consul potatoes and best Scotch seed revealed no difference in health and vigour between the two stocks. In 1934 enough Scotch seed of the virus-susceptible but otherwise outstanding new early variety Arran Pilot was supplied to individual farmers (in Lancashire) to plant half-acre plots, these being situated at least 60 yds. from any other stocks of unknown health. The produce was planted in 1935, each farmer planting 6 or 7 acres, and the resulting plants were vigorous, with virus infection not exceeding 2 per cent., the yield being 12 tons per acre. The produce of the seed plots in 1935 was sown in 1936 with similar results. It is important to maintain the ground free from volunteer plants arising from potatoes left from a previous crop.

Dufrénoy (J.) & Bouget (J.). **Études sur des maladies à virus de la Pomme de Terre.**—[Studies on certain virus diseases of the Potato.] *Ann. Sci. nat., Bot.*, Sér. X, xix, pp. 181–200, 6 figs., 1 graph, 1937.

Potato viruses in north-western Europe are roughly divisible into

two large groups, namely, those belonging to the virus X group, non-transmissible by the aphid *Myzus persicae*, and those that are transmissible by this insect and include viruses Y and F [*R.A.M.*, xvi, p. 337]. A brief description is appended of the various symptoms caused in the potato by these viruses alone or in combination with one another, and figures are given of cytological modifications effected as a result of infection by viruses X and Y [ibid. xvi, p. 705]. In France, potatoes are almost always infected by at least one virus, frequently by two, and often by three. With reference to the transmission of virus Y, the authors state that at Saint André de Cubzac potatoes carrying X developed 'frisolée' (X+Y) [ibid., xiv, p. 246] as early as June as a result of infection by Y transmitted by *M. persicae* which had overwintered on cabbages. At Truc-Vert, on the Atlantic Coast, potatoes grown from Y-free seed showed 90 to 100 per cent. primary symptoms of infection by Y '(bigarrure)' [ibid., xv, p. 460] in July, the vector *M. persicae* hibernating on a peach tree in the vicinity. The rapid spread of the virulent virus Y is responsible for most of the degeneration of potatoes in France.

The results of experiments carried out by Bouget at the suggestion of Costantin demonstrated the possibility of preserving stocks of Majestic and Up-to-Date potatoes (received free from virus X from Murphy in Ireland) or of virus-free potatoes grown from true seed, from infection by virus Y by cultivating them in fire-breaks in pine forests on the south-west French coast of the Atlantic (Landes), at a distance of some kilometres from vegetable crops or peach trees, or under insect-proof cages the construction of which is briefly described.

Cralley (E. M.) & Tullis (E. C.). **Effect of seed treatments on seedling emergence, severity of seedling blight, and yield of Rice.**—*Bull. Ark. agric. Exp. Sta.* 345, 24 pp., 1 fig., 1937.

In this account of a detailed study carried out in Arkansas from 1933 to 1936, inclusive, on seedling blight of rice the authors state that the condition is a disease complex found in most rice-producing countries and that the amount of blight that develops in a crop depends on weather conditions and the microflora of the rice seed and soil. Isolations from 2,074 diseased seedlings gave most consistently species of *Fusarium* (of which the two most frequently isolated closely resembled *Gibberella moniliformis* and *G. fujikuroi*), a *Rhizoctonia* closely resembling *R.* [*Corticium*] *solani*, *Curvularia lunata* [*R.A.M.*, xvi, p. 490] and *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: loc. cit.] all of which produced blighting of Supreme Blue Rose rice seedlings grown *in vitro* under aseptic conditions and have been reported as pathogenic on rice seedlings by other workers.

Under greenhouse conditions the disease occurred at soil temperatures ranging from 18° to 34° C. The heaviest pre-emergence blight usually developed at the lower temperatures, at which *O. miyabeanus* was most active; *F.* spp. were most active at the higher ones. Experimental seed treatments with formaldehyde, ethyl mercury phosphate, ethyl mercury chloride, and red copper oxide dust gave inconsistent results [which are tabulated] and are not at present recommended.

Zaprometoff (N. G.). Пирикуляриоз Риса [Piriculariosis of Rice.] —*Социалистическая Наука и Техника* [*Socialistic Science and Technique*], Tashkent, *1937*, 2, pp. 76–78, 1937.

The author records the occurrence of rice blast (*Piricularia oryzae*) in the Russian Central Asia (Uzbekistan), and gives a summarized review of the work done in the investigation of this disease and of its control.

Hoedt (T. G. E.). **Bestrijding van meeldauw.** [Mildew control.]—*Bergcultures*, xi, 21, pp. 761–762, 1937.

Sulphur dusting for rubber mildew [*Oidium heveae*: *R.A.M.*, xvi, p. 202] control in west Java [ibid., xiv, pp. 152, 743; xv, p. 145; xvi, p. 160] should be commenced immediately the first transparent spots become perceptible on the newly formed leaves after wintering and continued at one- to two-weekly intervals until the process of refoliation is complete in 80 to 90 per cent. of the trees in the plantation. The sulphur should be applied by means of a motor apparatus at the rate of 3 to 5 kg. per hect. In production (as opposed to seed) plantations it is neither necessary nor desirable to eliminate mildew entirely, not only on account of the prohibitive cost of the operations but also because the over-luxuriant flowering resulting therefrom is liable to weaken the trees and induce an excessively humid atmosphere in which bark pathogens thrive.

De Fluiter (H. J.). **Mouldy rot, geconstateerd in het ressort van het Besoekisch Proefstation.** [Mouldy rot observed in the district served by the Besoeki Experiment Station.]—*Bergcultures*, xi, 26, pp. 945–946, 1937.

Mouldy rot of *Hevea* rubber (*Ceratostomella fimbriata*) [*R.A.M.*, xv, p. 345] is reported to have been observed for the first time during the early part of 1937 in the district of Java served by the Besoeki Agricultural Experiment Station. The tapping of diseased trees should be discontinued and daily applications of 10 to 20 per cent. agrisol, 7·5 to 15 per cent. brunolinum and carbolineum plantarium, 5 to 10 per cent. kill-germ, 3 to 5 per cent. izal [ibid., xv, p. 734; xvi, p. 634], or 3 to 5 per cent. paragerm made to the bark until a cure is effected, after which a preventive treatment should be given every four days. A mixture of asphalt (60 per cent.), solar oil (40 per cent.), and carbolineum (10 per cent.) may also be used as a protective coating. Izal (3 to 5 per cent.) should be used to disinfect the tapping knives, which have been shown to constitute the chief means of spread of the fungus in Malacca. The duration of the tapping period should be restricted to a week alternating with a week's rest.

Soesman (J. G.). **Maatregelen en tapcontrôle ter bestrijding van Phytophthora.** [Precautions and tapping restriction for *Phytophthora* control.]—*Bergcultures*, xi, 24, pp. 865–869, 1 diag., 1 graph, 1937.

Details are given of the writer's experiments, conducted in the Besoeki district of Java from 1933 to 1937, inclusive, showing the beneficial effects on stripe canker (*Phytophthora*) [*palmivora*] of rubber [*Hevea brasiliensis*: *R.A.M.*, xvi, p. 634] of curtailment of the tapping

period, antiseptic treatment of the tapped surfaces, and maintenance of the trees and soil covering in a healthy condition.

SCHADE (A. L.) **Observations on a Monascus isolated from Rubber.**—*Mycologia*, xxix, 3, pp. 295–302, 1937.

A specimen of smoked crude rubber of *Hevea brasiliensis* received at the Harvard Botanical Museum in 1931 was attacked by mites and various fungi, including *Monascus ruber* [*R.A.M.*, ix, p. 736]. Inoculation tests showed that *M. ruber* and *M. purpureus* grew well on crude rubber free from mites, the former developing rather better than the latter on pale crepe, smoked sheet, and latex-sprayed rubber. The smoked condition hindered but little the growth of the fungi.

CHAND (H.). **Study of the fungus flora of the Lahore soils.**—*Proc. Indian Acad. Sci.*, Sect. B, v, 6, pp. 324–331, 1937.

As a result of platings from soils taken from plots at the Government College Botanic Garden, Lahore [*R.A.M.*, xvi, p. 710] the author isolated 19 species of fungi, including *Rhizopus nodosus*, *Mucor botryoides*, *Cunninghamella echinulata*, *Sordaria macrospora*, *Chaetomium globosum*, *Trichoderma lignorum* [ibid., xv, p. 824], *T. glaucum*, *Spondylocadium fumosum*, *Heterosporium allii*, *Helminthosporium anomalum*, *Alternaria malvae*, and *Stemmaria terrestris*. A complete list of fungi so far recorded from Indian soils is appended. Species of *Aspergillus* and *Penicillium* are the most numerous in soil, and either the former or the latter predominate depending upon whether the temperature is high or low.

HAMPP (H.). **Prüfung der Hopfenperonospora-Bekämpfungsmittel auf dem Hopfenversuchsgut Hüll 1936.** [Trial of Hop *Peronospora* control preparations in the Hüll Hop experimental garden in 1936.] —*Prakt. Bl. Pflanzenb.*, xv, 1–2, pp. 20–24, 1937.

Details are given of laboratory and field experiments in the control of hop downy mildew (*Peronospora*) [*Pseudoperonospora humuli*] in Bavaria [*R.A.M.*, xvi, p. 61] in 1936, from which it appears that all the fungicides officially authorized for this purpose, viz., Wacker's Kupferkalk [copper oxychloride: ibid., xv, p. 583; xvi, p. 230], brand 934 of the same, cuprenox, and Kupferkalk Spiess, gave very satisfactory results, both as regards toxicity to the fungus and adhesion to the plants in the presence of rain, the latter feature being particularly marked in the case of 934. All were applied at the rate of 1 per cent. except cuprenox, which was used at a strength of 0·5 per cent. for the main treatments and at 1 per cent. only for two of the final ones; the latter concentration, however, caused scorching of the styles and unsightly blemishes on the cones. Of the other preparations tested only 0·5 per cent. Kupferkalk 'V' reached the requisite standard of efficacy for inclusion in further more extensive trials.

D'EMMEREZ DE CHARMOY (D.). **La lutte contre la mosaïque de la Canne à sucre à la Réunion.** [The control of Sugar-Cane mosaic in Réunion.]—*Rev. agric. Réunion*, N.S., xlii, pp. 1–10, 1937.

This paper is a reprint of one already noticed from another source [*R.A.M.*, xv, p. 258].

McMartin (A.). **Pathological conditions affecting growth of Sugar Cane plant cuttings from Natal.**—*S. Afr. Sug. J.*, xxi, 5, pp. 267, 269, 271; 6, pp. 353, 355, 357, 359, 5 figs., 1937.

Buds produced from the base of sugar-cane setts emerge less rapidly than those at the top and do not so readily adjust themselves to their new environment. During this 'lag' phase they are subject to infection by a number of weak fungal parasites occurring either in the soil or in the internal tissues of apparently sound canes, viz., *Cephalosporium sacchari* [*R.A.M.*, xvi, p. 341], *Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., xvi, p. 206], *Melanconium* [*Pleocyta*] *sacchari*, *Himantia stellifera* [ibid., xv, p. 607], *Aspergillus* sp., *Penicillium* sp. (all on the setts), and *Rhizoctonia* sp. and *Pythium* sp. on the roots. The setts may decay before the shoots emerge or the latter may reach a height of a few inches before succumbing, while under favourable conditions for cane growth externally healthy plants may be produced, which, however, harbour the organisms in their tissues as mentioned above. Infection from internal sources appears to be most prevalent under very humid planting conditions, while dry weather promotes external contamination.

Field observations suggest that Co. 290 is more susceptible to *Cephalosporium sacchari* than Co. 281, which is prone to attack by *Ceratostomella paradoxa*. Root rots mostly affect Co. 290 and Co. 301, while *Pleocyta sacchari* is prevalent on P.O.J. 2725. For control it is recommended that only setts with white, well-formed buds should be planted, and plant cane should be exclusively used. Thin sticks and excessively short-jointed material should be rejected, as also should canes showing pathological symptoms of any kind. The physical condition of the soil at planting time should be as fine as possible and the setts should not be too deeply covered. Preliminary experiments indicate that the rots may be combated to some extent by organic mercurial treatment of the setts before planting, while beneficial effects may also be expected to follow partial soil sterilization.

Abbott (E. V.), Rands (R. D.), & Summers (E. M.). **Disease resistance and new seedling selection in 1936 at the U.S. Sugar Plant Field Station, Houma, La.**—*Sug. Bull.*, xv, 14, pp. 3–7, 1937.

Full details are given of the progress made during 1936 in sugar-cane breeding work at the Houma Sugar Plant Field Station, Louisiana [*R.A.M.*, xv, p. 605]. *Inter alia* it is stated that progeny studies conducted over three years on 8,900 seedlings from 43 crosses have resulted in at least 10 crosses which are very promising as superior disease resistant varieties.

Baldacci (E.). **La conception d'espèce chez les Actinomycètes par rapport à leur classification et à leur determination.** [The species concept in the Actinomycetes in relation to their classification and determination.]—*Boll. Sez. ital. Soc. int. Microbiol.*, ix, 5, pp. 138–147, 1937.

After referring to the confusion at present existing in the specific determination of the Actinomycetes, the author discusses in some detail the criteria on which he considers such determinations should be based.

Morphological characters are of absolute value in specific determinations, especially as regards their variations; biometrical characters are less important, but should be noted. Biochemical reactions are a useful guide only if studied together, and according to a standard technique. Chromogenesis has specific value only when associated with constant morphological and cultural characters. The significance of pathogenicity is as yet uncertain, as pathogenic activity in some genera may be inconstant. Species should not be made to depend mainly on biological characters, and physiological and nutritional characters and habitat have no specific value whatever. Pleomorphism in cultures needs to be taken into account as it may be a source of error. All the above-mentioned characters should be used as a basis for a complete systematic revision of the Actinomycetes.

NEILL (J. C.). **The mould fungi of New Zealand. I. The genus Penicillium.**—*Trans. roy. Soc. N. Z.*, lxvii, 1, pp. 101–112, 3 pl., 1937.

The author lists 19 species of *Penicillium* encountered in work on mould fungi in New Zealand, with short descriptions of the species, their cultural characters on Czapek's agar, and an indication of the habitat.

SHEAR (C. L.). **Mycological notes. I.**—*Mycologia*, xxix, 3, pp. 355–363, 1937.

In this the first of a series of notes on genera and species of fungi, the author discusses five subjects, of which the following may be mentioned. *Discella effusa* B. & C., as represented by a specimen in Michener's Herbarium on apple and believed to be part of the type collection has spores typical of the bitter rot of apple (*Glomerella cingulata*). From the examination of type specimens of the type species of *Naumovia* (*N. abundans*) [*R.A.M.*, vii, p. 808], *Rosenscheldia* and *Gibberidea*, the author concludes that these genera are synonymous, *Gibberidea* having priority; *G. obducens* Rick. on living stems of *Mentha* is regarded as identical with *R. paraguaya* which is renamed *G. paraguaya*. *Sphaeropsis uvarum* Berk. & Curt. 1874 is the same as *Coniothyrium diplodiella* (Speg.) Sacc. [syn. *Phoma diplodiella* Speg. 1878: *R.A.M.*, xvi, p. 152] on grapes. It is apparently rare in the United States.

KARLING (J. S.). **Pascher and the genus Asterocystis of De Wildeman.**—*Mycologia*, xxix, 3, pp. 291–294, 1937.

The genus *Olpidiaster* was proposed by Pascher in 1917 as a new name for *Asterocystis* (1893) on the ground that the latter name had already been used for a genus of the red algae by Gobi in 1879 [*R.A.M.*, viii, p. 282]. Gobi's genus, however, was spelt *Asterocytis* and there is, therefore, no good reason for replacing *Asterocystis* by *Olpidiaster*. De Wildeman differentiated *Asterocystis* from *Olpidium* on the grounds that the resting spores are stellate, with a thin membrane, a large refractive globule, and are not plasmolysed by glycerine, but these distinctions are no longer tenable. So far as knowledge goes at the present time there appears to be no good evidence for the separation of *Asterocystis* from *Olpidium*. The number of species of *Olpidium* described in the past few

years will require critical study before their validity can be determined conclusively.

Bataille (F.). **Monographie des Exoascacées d'Europe.** [A monograph of European Exoascaceae.]—*Ann. Soc. Linn. Lyon*, N.S. (*1935*), pp. 121–134, 1936.

A brief account is given of the distinguishing features of the Exoascaceae, supplemented by an outline of the history of the family, which the writer, following Saccardo, divides into *Exoascus* and *Taphrina* [*R.A.M.*, iv, p. 447; vi, p. 260], and by keys to the genera and species and a list of synonyms.

Săvulescu (T.) & Săvulescu (Olga). **Beitrag zur Kenntnis der Uredineen Rumäniens.** [A contribution to the knowledge of the Uredineae of Rumania.]—*Ann. mycol. Berl.*, xxxv, 2, pp. 113–118, 5 figs., 1937.

An annotated list is given of 21 species of rusts not hitherto reported from Rumania, two of which and one variety are new to science and are furnished with Latin diagnoses. *Puccinia dobrogensis* n.sp. forms on living leaves of *Iris pumila* in the Dobrudja (Dobrogea) diffuse, dark olive, discrete or confluent lesions, the centres of which are occupied by black teleutosori producing yellowish-brown teleutospores of variable shape, 33 to 54 by 15 to 21 (average 49·5 to 54 by 16·5) μ, with a fragile pedicel, 33 to 44 μ in length, intermingled with numerous oblong or ellipsoid mesospores, 30 by 15 μ, and provided with brown, linear to clavate paraphyses. *P. antirrhini* was introduced into the country in 1936 on *Antirrhinum majus* leaves and stems [see above, p. 752]. *Uromyces ambiguus* was observed on *Allium scorodoprasum* [ibid., xi, p. 619] leaves and stems in the Dobrudja, *Melampsora repentis* and *M. salicis albae* on *Salix repens* and *S. alba* leaves, respectively, both in Bessarabia, and *Melampsoridium carpini* on *Carpinus betulus* in Muntenia.

Cummins (C. B.). **Studies in the Uredinales of the Philippines.**—*Ann. mycol., Berl.*, xxxv, 2, pp. 98–105, 8 figs., 1937.

An annotated list is given of 22 species of rusts (13 new, with Latin diagnoses) recently collected by Mrs. Clemens in the Philippines, including *Puccinia arayatensis* n.sp. and *Uraecium derridicola* n.sp. on *Derris* sp.

Johnston (J. R.). **Los hongos 'royas' en Guatemala.** [The 'rust' fungi in Guatemala.]—*Rev. agric., Guatemala*, xiv, 9, pp. 473–478, 1937.

Among the rusts mentioned in this semi-popular note as affecting Guatemalan crops are *Puccinia rubigo-vera* [*P. triticina*: *R.A.M.*, xii, p. 499] on wheat, *Uromyces phaseolorum* [*U. appendiculatus*] on runner beans [*Phaseolus vulgaris*: ibid., xvi, p. 660], *U. striatus* on lucerne [see above, p. 754], *Tranzschelia punctata* [*Puccinia pruni-spinosae*: see above, p. 755] on peach and wild cherry (*Prunus capuli*), and *Phragmidium disciflorum* [*P. mucronatum*] on rose.

Liro (J. I.). **Über neue, seltene und vermeinte Ustilagineen.** [On new, rare, and presumptive Ustilagineae.]—*Ann. bot. Vanamo*, vi (*1935–1936*), 1, pp. 1–18, 1935. [Finnish summary. Received 1937.]

This is a critically annoted list of 11 new, 4 rare, and 3 presumptive Ustilagineae. *Tuburcinia colchici* [*R.A.M.*, xiv, pp. 12, 494] is recorded on *Narcissus triandrus* from Spain, this being apparently a new host for the smut.

Malençon (G.) & Yen (W. Y.). **Une nouvelle espèce de Sorosporium.** [A new species of *Sorosporium*.]—*Rev. Mycologie*, (N.S.) ii, 3–4, pp. 130–131, 2 figs., 1937.

A brief description [with a Latin diagnosis] is given of a smut, considered to be new to science, which the authors found in Morocco attacking the whole inflorescence of *Panicum repens*, and which they name *Sorosporium punctatum*. It is characterized by creamy-brownish, cylindrical or curved sori formed by the transformation of the whole inflorescence, 60 to 70 by 4 to 5 mm.; the spores are agglomerated into balls of several hundreds, measuring 43 to 72 μ or 54 to 102 by 42 to 70 μ [40 to 100 by 40 to 60 μ in the diagnosis]; they are spherical or subspherical, olive-brown, 4·8 to 7·5 μ in diameter or 5 to 6 by 7 to 9 μ [5 to 7 μ in the diagnosis], and superficially punctuated with sparse and clearly distinguishable warts. Microscopically the fungus approaches *S. africanum*, and macroscopically it resembles *S. syntherismae*.

Lojkin (Mary). **A study of ascorbic acid as an inactivating agent to Tobacco mosaic virus.**—*Contr. Boyce Thompson Inst.*, viii, 6, pp. 445–465, 4 graphs, 1937.

This is an amplified account of studies referred to in part in a preliminary notice by the author already abstracted [*R.A.M.*, xvi, p. 282]. In these further studies the course of oxidation of ascorbic acid and inactivation of tobacco mosaic virus under varying conditions was followed by simultaneous measurements of the amount of ascorbic acid oxidized and the relative infectivity of the virus in the virus-ascorbic acid system. It was found that the rate of oxidation of the ascorbic acid and the rate of inactivation of the virus were highest in media approximately neutral in reaction and diminished with an increase or decrease in acidity. The virus remained unaffected in contact with the reduced form of ascorbic acid, or with dehydroascorbic acid provided the acids were not undergoing autoxidation, but if the ascorbic acid underwent autoxidation induced by catalytic cupric ions the virus lost its infectivity. Autoxidation of ascorbic acid without inactivation of the virus, however, can be induced in the absence of copper by alkaline media of P_H 8·6 or by the enzyme hexoxidase, and these results suggest that the inactivation of the virus is due to some intermediate product of the autoxidation of ascorbic acid by the cupric ions. Such inactivation does not occur when the autoxidation proceeds in the presence of catalase and this indicates that the intermediate product is a peroxide. Cupric peroxide failed to explain the inactivation reaction and the active substance is thought to be probably an organic peroxide.

Gratia (A.). **Mise au point, pour les usages biologiques, de l'ultra-centrifugeur à air comprimé de Henriot et Huguenard.** [The adaptation for biological purposes of Henriot and Huguenard's compressed air ultracentrifuge.]—*C.R. Soc. Biol., Paris*, cxxv, 17, pp. 371–375, 2 figs., 1937.

Some recommendations of a highly technical order are made for adjustments to Henriot and Huguenard's compressed air ultracentrifuge facilitating its use for biological purposes, such as the study of bacteriophages. In this connexion mention is made of the fact that when the juice of mosaic-diseased tobacco is centrifuged for about ten minutes at 75,000 revolutions per minute, the specific mosaic antigen remains in suspension in a limpid, colourless liquid, entirely free from sediment, reacting by pronounced flocculation to the addition of anti-mosaic serum [cf. *R.A.M.*, xvi, p. 713].

Best (R. J.). **The quantitative estimation of relative concentrations of the viruses of ordinary and yellow Tobacco mosaics and of Tomato spotted wilt by the primary lesion method.**—*Aust. J. exp. Biol. med. Sci.*, xv, 2, pp. 65–79, 6 figs., 1937.

The results of dilution experiments with the viruses of ordinary and yellow tobacco mosaic [*R.A.M.*, xvi, p. 638] and tomato spotted wilt [ibid., xvi, p. 571] at the Waite Agricultural Research Institute, University of Adelaide, are tabulated and discussed.

For the two first-named viruses, tested on *Nicotiana glutinosa*, the dilution curve falls into three parts: (*a*) a flat portion at high virus concentrations where a large change in concentration results in a much smaller change in the number of lesions produced; (*b*) a straight line section covering a useful concentration range (1/1,000 to 1/10,000) in which a change in concentration involves an equivalent change in the number of lesions; and (*c*) a section at high dilutions where changes in lesion numbers are again proportionately smaller than concentration. In the case of ordinary mosaic it was immaterial whether pure virus or clarified infective juice was used for the preparation of the inoculum.

The general shape of the curve for tomato spotted wilt (tested on Blue Pryor tobacco plants) resembles the foregoing except at the lower concentrations, where changes in lesion numbers are proportionately greater than those in virus concentration. This divergence, however, has been shown to depend on the season at which the counts are made, as well as on the environmental conditions prevailing after inoculation.

The degree of aggregation of ordinary tobacco mosaic virus in concentrated solutions has been shown to change with dilution. For instance, if a portion of a suspension containing the white, satiny fibres of the virus [ibid., xvi, p. 639] is diluted to only five times its original volume, the fibres are no longer visible, having apparently been broken down to submicroscopic dimensions. As the dilutions increase, the possibility of a reaggregation of dissociated particles will become progressively slighter. Another variable factor to be taken into consideration in curve formation is the degree of susceptibility of the host to the particular virus concerned. There are, indeed, such a number of factors implicated in the relationship between virus concentration and lesion numbers that a single equation can scarcely be expected to represent

the connexion over the whole dilution range. For practical purposes, however, that section of the curves over which direct proportionality between virus concentration and lesion numbers operates affords a reasonably accurate working range for the estimation of relative concentrations.

GOLDIN (M. I.). **On the so-called masking of virus diseases.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xv, 9, pp. 567–569, 1937.

The results of experiments in 1936 in the Crimea, in which *Nicotiana glutinosa* plants were inoculated with the juice obtained from aseptically collected apical leaves of apparently healthy tobacco plants taken from field plots with 36, 28, 28, and 18 per cent., respectively, of the plants visibly infected with mosaic, showed that 87, 60, 43, and 20 per cent., respectively, of the apparently healthy plants carried the mosaic virus in a masked condition, the real infection percentage in those plots being thus raised to 91, 65, 59, and 35, respectively. This indicates that determination of percentage infection with mosaic in tobacco plantations, and probably also in the case of other virus diseases by external symptoms alone is not reliable.

SILBERSCHMIDT (K.). **A doença 'vira-cabeça' do Fumo.** [The 'vira-cabeça' disease of Tobacco.]—*Biologico*, iii, 6, pp. 183–184, 1937.

A brief description is given of a virus disease, first noticed some years ago, which is stated to cause very considerable damage to tobacco plantations in the State of São Paulo, Brazil. The most striking outward symptom of the trouble, responsible for its vernacular name 'vira-cabeça' [twisted head] is a bending down of the growing point of the stems, due to the unilateral development of elongated necrotic lesions on the stems [cf. 'corcovo' in the Argentine: *R.A.M.*, xi, p. 269]. In the initial stages of infection, the young leaves lose their natural brightness, become markedly rugose, and their margins curl downwards; later, there is a clearing of the veins, the younger leaves are chlorotic and the older yellow, and angular necrotic markings develop along the veins of the third order; in still further advanced cases, these necrotic lines may also run along the main veins, leaving wide interveinal bands of green tissue, especially on the older basal leaves, from which they extend to the stem. Many of the diseased plants also show a reduction of their root system, with a rot of the finer roots. So far tobacco varieties resistant to the disease have not been found, but considerable variations in the incidence and severity of the trouble have been observed in different districts. The disease is transmissible by grafting, and, according to observations in Campinas by Dr. Santos Costa, by the insects *Thrips tabaci* and *Frankliniella* sp. It is most destructive to tobacco seedlings, many of which are usually killed soon after transplanting in the field. The control measures recommended are a strict roguing of all diseased plants both in the seed-bed and in the field, as well as the suppression of the insect vectors.

THUNG (T. H.). **Phytopathologische waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag Oogstjaar 1935–1936. *Meded. Proefst. vorstenl. Tab.*, 84, pp. 25–42, 1937.

The writer's insistence in his previous year's report [*R.A.M.*, xv,

p. 686] on the need for a widespread campaign against mosaic in the Vorstenland (Java) tobacco plantations [ibid., xvi, p. 413] bore fruit in the extensive adoption of such precautionary measures as dipping the workers' hands in 4 per cent. formalin for planting operations, the roguing-out of diseased seedlings by means of specially constructed ploughs, and chemical control of the insect vectors of the disease. These measures resulted in an appreciable reduction of infection in most plantations, but many problems, both theoretical and practical, remain to be solved in connexion with the epidemic developments of mosaic.

Slime disease [*Bacterium solanacearum*: loc. cit.] appears to be steadily gaining ground, and there are indications that the causal organism, like *Phytophthora* [*parasitica nicotianae*: loc. cit.], is mud-borne. In connexion with the control of the latter fungus attention is drawn to the necessity of complete fermentation of the tobacco refuse used for manuring. The disinfection of irrigation channels by means of 1·5 per cent. ammonia, passed through the flowing water for 4½ hours, was experimentally shown to be feasible but the expense and other difficulties of the method are likely to prove prohibitive in practice. Terbolan (2 per cent.) [ibid., xiv, p. 533] and 1·5 per cent. copper sulphate are also effective for superficial soil sterilization. When water cultures of Canary and Timor tobacco seedlings were inoculated with mycelium of *P. parasitica nicotianae*, the roots of the former were permeated in two days by the mycelium and bore profuse sporangia, while in the latter the fungus made practically no growth. The Canary roots soon died, whereas those of the Timor plants remained in a sound condition and made further growth.

Some delay in the development of mildew [*Erysiphe cichoracearum*: ibid., xv, p. 686] and reduction in its incidence again followed the application of sulphur to the soil, but complete control was not achieved. A correlation has been established between the abundant foliar growth consequent on wide planting and increased mildew infection. Groundnuts grown in frames with infected tobacco plants showed mildew spots within ten days and during the second month *Crotalaria juncea* plants in the frame also contracted infection. Some divergences in the size of the conidia may point to morphological or to biological differences in the strains under observation, but the question remains to be decided by inoculation experiments.

Bacillus [*Erwinia*] *aroideae* [ibid., xv, p. 346] is probably responsible for the majority of cases of stem rot, which assumed a severe form in November, 1936. The specific 'top rot' symptoms of the disease were only once observed locally in 1935; as a rule the tops remain normal and the rotting is confined to the pith of those portions of the stem from which the leaves have already been harvested.

Leaf spot [*Cercospora nicotianae*: ibid., xvi, p. 414] was virtually absent in 1935, but more serious attacks occurred during the second half of November, 1936, as a sequel to heavy precipitation.

McMurtrey (J. E.). **Distinctive effects on the growth of the Tobacco plant when certain mineral nutrients are deficient.**—*Proc. Amer. Soc. hort. Sci.*, xxxiv, pp. 478–479, 1937.

In this note on the symptoms of mineral deficiencies on tobacco

[*R.A.M.*, x, p. 346] the author states that nitrogen deficiency causes the whole plant to become light green and the lower leaves to turn light brown later on. Phosphorus deficiency [ibid., xv, p. 263] produces dark green plants, with dark brown leaves if 'firing' takes place. Shortage of potassium or magnesium produces localized effects, chlorosis of the lower leaves being the most salient symptom. Lack of iron or manganese produces chlorosis; in each case the veins remain green, but manganese deficiency causes a necrotic spotting scattered over the leaf, while iron deficiency does not generally produce spotting. Sulphur deficiency also causes chlorosis, in which the veins are paler than the tissue between them. Calcium shortage first shows itself as a hooking downward of the tip of the young leaves of the terminal bud followed by the death of the young leaves at the tips and margins. Boron deficiency [loc. cit.] produces a light green colour at the base of the young leaves of the bud, followed by their breakdown, which in turn, if not too severe, is succeeded by later growth with twisted or distorted leaves.

Chamberlain (E. E.) & Brien (R. M.). **Tomato seedling damping-off.** —*N.Z.J. Agric.*, liv, 6, pp. 321–327, 3 figs., 1937.

Results are given of experiments on the control of damping-off (*Pythium ultimum*) of tomato seedlings [*R.A.M.*, xv, p. 690] by the use of disinfectant dusts, the treated seed being sown in untreated or steam-sterilized soil inoculated with the fungus. None of the seven dusts tested gave complete control, but several were sufficiently effective to warrant their use by growers who have not facilities for treating their soil, and of these ceresan U.T. 1875, agrosan G, and high-grade copper carbonate are recommended. Monohydrated copper sulphate and red copper oxide gave very promising results each in one test, and copper oxychloride in one test proved slightly less efficient than the ceresan. Damping-off was more difficult to control in soil which had been steam-sterilized before being inoculated with the fungus.

Müllers (L.). **Bakterielle Tomatenwelke.** [Bacterial Tomato wilt.]— *Obst- u. Gemüseb.*, lxxxiii, 6, pp. 85–86, 1 fig., 1937.

Popular notes are given on the symptoms of tomato bacterial wilt (*Aplanobacter michiganense*) [*R.A.M.*, xvi, p. 642] and stem rot (*Didymella lycopersici*) [ibid., xiii, p. 403], both of which are stated to have caused heavy damage to large-scale greenhouse and field plantings in Germany in 1936. For the control of the former the writer recommends seed treatment with ceresan and dipping the roots of the seedlings in a loam emulsion with the admixture of 0·25 per cent. uspulun. The pathogen is largely spread from plant to plant by the common practice of cutting off the young shoots or removing them with the finger-nail; it is preferable to break them off and so avoid contact with the wounds. Diseased plants and the soil surrounding them should be burnt and infested sites not replanted with tomatoes during the next season.

Cook (W. S.). **Relation of nutrition of Tomato to disposition to infectivity and virulence of Fusarium lycopersici.**—*Bot. Gaz.*, xcviii, 4, pp. 647–669, 7 figs., 1937.

A tabulated account is given of experiments conducted to determine

the relation of nutritional factors to the reaction of tomatoes to infection by *Fusarium* [*bulbigenum* var.] *lycopersici* [*R.A.M.*, xvi, p. 419]. The susceptible Bonnie Best and the resistant Marglobe were used, and nutrition was varied by applying or withholding nitrates under otherwise identical conditions. The inoculum was applied either directly to the roots of plants growing in sterilized white quartz sand (post-inoculated) or to the sand before planting (pre-inoculated). Recovery of the fungus from the stem base was used as a criterion of infection and macroscopic symptoms as a criterion of virulence.

Infection was prevalent both in resistant and susceptible plants under minus nitrate nutrition, but external manifestations were commonly absent in this series, while no wilting of Marglobe took place either in the plus or minus nitrate lots, though seedlings of this variety were readily infected in both series. Type of inoculation and age of plant were important factors in infection, pre-inoculation of the sand leading to a higher frequency of infection and symptom production, besides practically halving the incubation period (25 as against 44 days for post-inoculation). Post-inoculated plants under minus nitrate culture developed no symptoms, even if infected. In the plus nitrate series Bonnie Best, either pre- or post-inoculated, showed a high frequency of infection and symptom production of both the chronic and acute types at all times of year.

Browning of the vascular bundles of the stem is not in itself an adequate criterion of infection, having been absent in 35·4 and 18·3 per cent. of the infected plants in the minus and plus nitrate series, respectively.

VERRALL (A. F.) & MAY (C.). **A new species of Dothiorella causing die-back of Elm.**—*Mycologia*, xxix, 3, pp. 321–326, 6 figs., 1937.

The pycnidial stage of the *Cephalosporium* responsible for die-back of elm [see next abstract] in North America has been isolated from elm collected in Virginia, Connecticut, Ohio, New Jersey, and Oklahoma, and developed in culture on sterilized elm twigs. Single spore isolations from pycnidia on naturally diseased elm produced the typical *Cephalosporium* stage on agar, and trees inoculated with single-spore isolates developed typical symptoms of the disease and yielded both stages of the fungus. The pycnidia develop sparsely on newly formed cankers on twigs and small branches and are often associated with other fungi. The fungus is named *Dothiorella ulmi* n.sp., with a diagnosis in English and Latin. The basal stroma is irregularly circular to elongate, 100 to 385 μ across, and early erumpent; the pycnidia are partially embedded in the stroma in groups of 2 to 12, occasionally single, subcoriaceous when mature, glabrous, globose to irregular, 63 to 161 μ in diameter, with non-papillate ostioles and unicellular, hyaline, elongate, straight or slightly curved conidia, rounded at both ends and measuring 2·9 to 5·4 by 0·5 to 1·0 μ (average 3·6 by 0·8 μ); conidiophores are absent and the conidia histogenic.

The fungus was isolated from 42 per cent. of 57,547 specimens of elm suspected of Dutch elm disease [*Ceratostomella ulmi*] originating from 28 States and Canada.

Creager (D. B.). **The Cephalosporium disease of Elms.**—*Contr. Arnold Arbor.*, x, 91 pp., 16 pl., 2 figs., 1 graph, 1937.

This is a comprehensive, tabulated account of the writer's studies on the *Cephalosporium* disease of elms, an abridged version of which has already been noticed from another source [*R.A.M.*, xvi, p. 645]. The disease appears to be restricted to the United States and Canada, where it chiefly attacks *Ulmus americana*, though *U. fulva* and *U. pumila* may also be infected and in the laboratory *U. japonica* proved susceptible. The detection of primary leaf lesions and of large-scale pycnidial production, new features of the disease, is reported here in addition to the more generally recognized symptoms.

Two types of fructification are formed by the fungus—one bringing it into relation with the Hyphomycetes and the other with the Sphaerioidaceae; both have now been shown to be essentially 'endoconidia'. The taxonomic position of the organism is obscure; on some media it presents typical *Cephalosporium* characters, on others those of *Cadophora* develop, while on others again an affinity with the Sphaerioidaceae is indicated. *Cephalosporium* fructifications are formed in profusion on a synthetic nutrient agar medium without sugar. Pycnidia are formed abundantly on over-wintered twigs killed by the organism and the disease is largely spread by pycnospores with the aid of wind, rain, and insects. The pycnidial stage has recently been named *Dothiorella ulmi* [see preceding abstract] and while this position is as good as any other for the organism at present the author considers more information is desirable for a satisfactory determination. The mycelium spreads from the vascular system of the leaf veins into that of the stem and subsequently invades the wood parenchyma, rays, pith, cambium, phloem, and cortical parenchyma.

Spierenburg (Dina). **Bestrijding van het 'vuur' in Eschdoorns.** [Control of 'fire' in Maples.]—*Tijdschr. PlZiekt.*, xliii, 6, pp. 150–151, 1937.

Maples (*Acer* spp.) in general and sycamores (*A. pseudoplatanus*) in particular are liable in Holland to infection by *Nectria cinnabarina* [*R.A.M.*, xvi, pp. 286, 299], control of which may be effected as follows. The trees should be given a preliminary application of Bordeaux mixture (7-5-5-50) to prevent the germination of any spores that may be present on the branches. Lesions should be treated with fruit tree carbolineum (50 per cent. in summer, 100 per cent. in winter) and the diseased areas then excised down to the healthy tissue, the debris being collected in sacks placed round the stems and burnt. The wounds are then treated with 10 per cent. carbolineum and (after drying) covered with coal tar, whereupon another application of Bordeaux mixture should be given. The same preparation should be applied in the following spring and autumn to all affected trees.

Bottomley (A[vrril] M.). **Some of the more important diseases affecting timber plantations in the Transvaal.**—*S. Afr. J. Sci.*, xxxiii, pp. 373–376, 1937.

The only timber trees grown to any extent in the Transvaal are black

wattle (*Acacia mollissima*), eucalypts, and pines, and of these the first-named is as yet apparently free from any important specific disease. Eucalypts are not subject to any widely distributed disease though two are potential sources of danger, namely stem rot and root rot caused by *Stereum hirsutum* and *Armillaria mellea*, respectively. The former is a common saprophyte throughout the country and was responsible for a soft dry rot of the centre of the stem of *Eucalyptus globulus* near Roodepoort in 1919; the latter caused a dying off of *E. paniculata* near Tzaneen in 1932. *A. mellea* [*R.A.M.*, xiii, p. 425] and *Helicobasidium compactum* [ibid., xiv, p. 426] are, however, serious diseases of standing pine and have occasioned the death of thousands of pine trees in the Zoutpansberg mountains during the last four or five years. The Transvaal form of *A. mellea* differs from the typical form in the absence of rhizomorphs, spread being effected by means of root contact. The disease causes a yellowing of needles followed by wilting and death. It appears to follow the planting of exotics on land previously carrying native timbers and in the area in question stumps and roots of *Parinarium mbola* are probably the chief source of infection. In the Cape typical rhizomorphs are commonly found on fruit trees attacked by the fungus. Trees infected by *H. compactum* show a stunting of the terminal shoots, yellowing of the needles, followed by wilting and death, a marked constriction at the collar, with sometimes a purplish-brown growth of the fungus. Infection is probably spread by spores or by mycelium in the soil and not by root contact.

Summary of legislation affecting agricultural industries as at 31st December, 1936.—*Rep. agric. Dep. St Kitts-Nevis*, pp. 46–49, 1937.

Schedules are given of plant disease legislation in force in St. Kitts and Nevis, West Indies, on 31st December, 1936.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xi, 6, p. 120, 1937.

French West Africa (Ivory Coast). A Decree of the Governor-General of French West Africa, dated 9th January, 1937, approves a Decree of 17th November, 1936, of the Lieutenant-Governor of the Ivory Coast, enforcing the declaration of groundnut rosette [*R.A.M.*, xvi, p. 653].

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. List of intercepted plant pests, 1936.—83 pp., 1937.

Lists are given of pests and diseases intercepted on plants or plant products entering the United States during the period 1st July, 1935, to 30th June, 1936. Among the interceptions recorded are *Physalospora obtusa* on apple from Australia [*R.A.M.*, xi, p. 114], *Sclerotium oryzae* [*Leptosphaeria salvinii*] on rice from Australia and South Africa, *Phoma destructiva* on *Capsicum annuum* from Brazil and Mexico, *Gloeosporium limetticolum* on lime from Brazil, Costa Rica, Cuba, Guatemala, Honduras, and Panama, and *Macrosporium* [*Alternaria*] *tomato* on tomato from Italy [ibid., xiii, p. 809].